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SOME ASPECTS OF THE RECREATIONAL GEOGRAPHY OF THE NORTH SASKATCHEWAN RIVER VALLEY - EDMONTON

by

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A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled Some Aspects of the Recreational Geography of the North Saskatchewan River Valley - Edmonton. Submitted by James Alexander Proudfoot in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

The North Saskatchewan River Valley within Edmonton provides a valuable recreation area for a rapidly expanding population which is now approaching 400,000 people. The basic purpose of this thesis is to present the results of an investigation into the physical qualitites of the valley and of the recreational use of the land and water within it.

Historically, Edmonton has long been dependent on the river. Initially, it served as a transportation route to the fur game area of the interior of what is now Alberta. As the Edmonton settlement grew in size, recreational land uses such as skating and boating came into prominence. Later, river steamers carried passengers on evening and holiday excursions for some distance up and downstream from the City. Presently, a diesel powered replica of the earlier steamers carries passengers along the river within the city limits. In addition, smaller outboard motor boats and canoes are beginning to use the river in increasing numbers.

The relief, weather and climate, soils and the vegetation of the river valley are basic to the recreational land uses. Where there is little relief, slope sports such as skiing are not possible. Where there is too great relief, there is no soil development or the slopes are too unstable to support vegetation. Where the ground is sheltered from the sun by the vegetation cover, trees and shrubs grow more readily and provide acceptable picnic areas free from winds and the heat.

The North Saskatchewan River is a vital resource element within the valley. It has a large water surface which can be made available to pleasure craft through an understanding of its high and low water levels, its channels, and its other physical features.

The valley is central to all of Edmonton since it cuts diagonally through the City. Recreational participation in the valley is increasing. It is therefore necessary that increasing attention be paid to the geographical phenomena that concern recreation. In this way, a more efficient recreational land use pattern will be possible and the optimum density of participation can be obtained.

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INTRODUCTION

Today more than ever before, leisure factors are taking on an important role in community life. A large proportion of the adult population is excluded from the labor force. The young enter it later while the old leave it earlier. There is therefore more time for recreation during the life expectancy of the average citizen. In addition, there is an increasingly shorter work week and a general rise in paid vacations. In his Land for Americans, written in 1963, Marion Clawson states that the total leisure time in the nation has about doubled since 1925 and that the "recreation explosion" in the United States is five times that of the "population explosion".[1] Presently, Canadians are caught up in this rapid recreational movement to a degree previously unparalleled.

Within Edmonton, the most important natural recreation attraction is the North Saskatchewan River Valley. Historically, this valley has been prominent in the development of Edmonton as a metropolitan community with a population in excess of 357,000 people in 1964. One of the very important aspects of this valley has been its long-time suitability as a recreational area. But, the recreational value of the river valley to Edmonton is no better than the use that can be made of it.

Statement of the Problem

Within the past five years there has been an increased interest in valley recreation. The golf courses, playing fields and other areas have all experienced increasing use. In addition, new facilities such as the Storyland Valley Zoo have been added to the growing recreational network of the valley. Large areas such as Mayfair Park are in the develop-

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[1] Marion Clawson, Land for Americans, Chicago, 1963, pp. 34-56.

ment stage. Big Island Development Limited and other smaller private concerns have undertaken projects in and along the valley and have emphasized the use of the river itself. The city administration has also done some preliminary work toward establishing boating facilities along the river. It would therefore appear that the river has been important to the recreational activities of Edmontonians for nearly 100 years. Because of a great population increase, it is only in recent years that the valley features have been recognized for their true worth as a recreational resource.

In view of the recent expansion in valley recreational facilities and in view of the proposed expansion, it might be expected that considerable research into the physical properties of the valley would have been conducted by the City of Edmonton or by other agencies on their behalf. Investigation has proven, however, that only a superficial coverage of the major valley characteristics has been undertaken. There is therefore an apparent need for research in several areas including physiography and the characteristics of the river in particular.

In this thesis, an attempt has been made to provide an integrated study of the major physical and cultural elements of the river valley as they pertain to recreation within it. In addition an attempt has been made to present in maps and other forms those features of the valley that are of major concern to valley recreation in an attempt to provide some of the required research materials on the valley.

Definition of Terms

"Recreation" as defined by Meyer and Brightbill is "...any activity engaged in during leisure time and primarily motivated by the

satisfaction derived from it. This recreation can be mental, physical, or social or a combination of two or more of these factors. In addition, it is generally recognized that any recreation must be socially acceptable according to the morés of the particular community."[2]

Geography according to Richard Hartshorne "...is concerned to provide an accurate, orderly, and rational description and interpretation of the variable character of the earth's surface."[3]

A geographical point of view is ideally suited to a study of the river valley as a recreational resource. Geography is an integrative discipline wherein the physical and human elements of a particular region can be studied as a complex and presented as such. Although the base elements of other disciplines such as geology and sociology may be studied with a geographic point of view, it is only in geography that these may be integrated and presented as a "whole" rather than as unrelated separate parts. It is this ability to integrate and use the materials of other sciences in the presentation of the "whole" that makes the geographer indispensable to studies of a particular region.

Recreational geography is a newly emerging field that is becoming increasingly important to North Americans. With the great increases in leisure time, this aspect of geography is only beginning to be recognized for the role it can play in the planning of recreational facilities or in the interpretation of the phenomena characteristic of the recreational area.

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[2] H.D. Meyer, and C.K. Brightbill, Recreation Administration, Englewood Cliffs, New Jersey, 1956, p.1.

[3] Richard Hartshorne, Perspective on the Nature of Geography, Chicago, 1961, p.21.

Generally, because of the recognized importance of tourism to national and municipal economies, recreational geography has been regarded as a segment of economic geography. In American Geography, Inventory and Prospect, for instance, K.C. McMurry, the author of the section on recreational geography, considered it to be a branch of economic geography because recreation achieves significant proportions only in those areas of the occidental world which are relatively prosperous.[4] E.C. Prophet of the College of Science and Arts, Michigan State University of Agriculture and Applied Science, also considers it to be a part of economic geography. One of Prophet's students, R.S. Vogel, wrote a thesis on recreational geography, submitted in 1957, and tourism was a central subject of study.[5] Economists such as Marion Clawson have produced a great deal of work on recreation that has provided a valuable service to the field but it is too limited by the tourist base through which it is written to be considered a complete approach to recreational geography. Dr. R.I. Wolfe, a geographer for the Ontario Department of Highways, supports the view that the primary concern of recreational geography is more than a study in economics. In fact he says, "...there is much, much more to recreation than economics...."[6]

In spite of the dearth of material written in the name of recreational geography, it is quite apparent that the field is growing. For purposes of this thesis, recreational geography is considered to be

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[4] K.C. McMurry, "Recreational Geography," American Geography, Inventory and Prospect, Syracuse, 1964, pp. 251-255.

[5] R.S. Vogel, The Lake of the Ozark Region, Missouri: A Study in Recreational Geography, unpublished M.A. thesis, College of Science and Arts Michigan State University of Agriculture and Applied Science, 1957.

[6] R.I. Wolfe, "Perspective on Outdoor Recreation," Geogr. Rev., April, 1964, p.227.

the study of the geographic phenomena of a particular region as they relate to the leisure activities that are or might be conducted within that region.

Methods of Investigation

Because of the paucity of available research materials, a great deal of field work has been necessary in the preparation of this thesis. From the spring of 1964, continual investigation was conducted until the first week in November. Vegetation, soils and the river were the major topics of this field work. The area covered included the valleys of the North Saskatchewan River and its tributaries from Big Island downstream to the eastern city limits. This extended period of investigation was necessary because of the seasonal changes of the river in particular.

Survey materials in matters relating to the casual recreation use of the river valley are the result of investigations carried out during the summer of 1963. At this time, the author was a member of a research team working for the Parks and Recreation Department of the City of Edmonton. A questionnaire was used together with a participation count to determine the reasons why people came to the public recreation areas of the valley and to discover in what numbers they came.

Interviews with provincial and local government officials provided considerable material of a hydrological and recreational nature in particular. Also, several "old timers" who were interviewed were able to relate historical information not found in other sources. Interviews also led to the discovery of old materials relating to the recreational habits of people in early Edmonton and Strathcona. These materials were found among papers from the Strathcona Baptist Church corner stone laid

in 1904. The church was demolished in 1964.

The files and personnel of the Parks and Recreation Department provided the data on organized recreation used in this thesis. Mr. Bruce Wilson of that department was most helpful in this regard. Although there were not annual reports for all of the years required, Mr. Wilson was able to assist the author greatly in finding supplementary materials.

Maps of Edmonton were used to evaluate the slope and other characteristics of the valley for recreational uses. Flow tables of the river, as supplied by the Water Resources Branch of the Provincial Government, were most helpful as was the copy of the Voligny report of the North Saskatchewan River supplied by them.

Method of Presentation

To emphasize the significant geographic features of the river valley, a topical approach will be used. Initially, there will be a chapter on the evolution of the land use pattern of the valley in the development of Edmonton followed by one on the present recreational uses. Then, a geographic evaluation of the physical qualities of the valley will be presented. The river will be treated separately because of its special character and importance to the entire recreational complex. The final chapter will consist of conclusions which result from the investigations.

CHAPTER I

THE EVOLUTION OF THE LAND USE PATTERN OF THE NORTH SASKATCHEWAN RIVER VALLEY

On October 15, 1795, William Tomison of the Hudson's Bay Company established a company post near the junction of the Sturgeon and the North Saskatchewan Rivers near the present town of Fort Saskatchewan. Following a practice of that day, he named the fort Edmonton after Edmonton, England. This was the first use of the name Edmonton in connection with a settlement area west of Lake Winnipeg. About 1805, the fort was moved to a location within the present city limits to be nearer the fur game area and to more adequately provide the supplies necessary to the fur trade. The fort occupied a north side river terrace, now the location of the City Power House adjacent to the north end of the present 105 Street Bridge. In 1821, after the amalgamation of the Hudson's Bay Company and its trade rival, the North West Company, the fort was moved to the high ground adjacent to the north end of the present High Level Bridge. This and other locations cited within the chapter can be found by the use of Figure 18.

By 1859, Edmonton had three main industries: commerce; transportation; and the manufacturing of boats, barrels and assorted small goods. Each of the industries was associated with the fur trade of Fort Edmonton. In the course of an interview, J.G. MacGregor, an Edmonton historian stated that the prime function of Fort Edmonton at this time was as a supply center, and that the above industries were to supply the needs of the traders. At this time, Edmonton was the key to the North Saskatchewan-Athabasca system upon which the fur trade was dependent for cheap and relatively easy transportation. All of the land use pattern was governed

by the fur trade operations. The growing settlement outside the fort occupied a small area of what is now the Rossdale community north and east of the 105 Street Bridge. This level land supplied many of the residential needs of the settlement, food and living space in particular. Because the river was near at hand and easily accessible, much of the commerce of the settlement was also conducted there. There were, however, isolated farmsteads on several of the terraces along the river for some distance up and down stream from the fort.

In the waning days of the fur trade in Edmonton, two separate events occurred which had lasting effects on the future land use pattern of the settlement. In 1864, a trans-continental route was established from Upper and Lower Canada to the gold fields of British Columbia. At this time, 150 Overlanders passed through Edmonton on their way west. The immediate effect was a short-lived trade increase. The lasting effect was that the center became better known west of the Rocky Mountains, thereby creating settlement interest. On his return from the Fraser gold fields in 1865, Tom Clover made a gold "strike" along the river in the area just upstream from where the Berverly Bridge is now located. This "strike" and the ensuing gold fever caused more settlers to come into the area. These settled on the available land of Rossdale, some few across the river in what is now Walterdale, and others in Cloverdale adjacent to the south end of the Low Level Bridge.

By 1881, the staking of land claims had taken on greater importance. M. Deane, a Dominion Land Surveyor was sent out from Ottawa to set up lots and boundaries for future settlement expansion. Figure 1 is a photo copy of Deane's map as issued from Ottawa in 1883. The importance

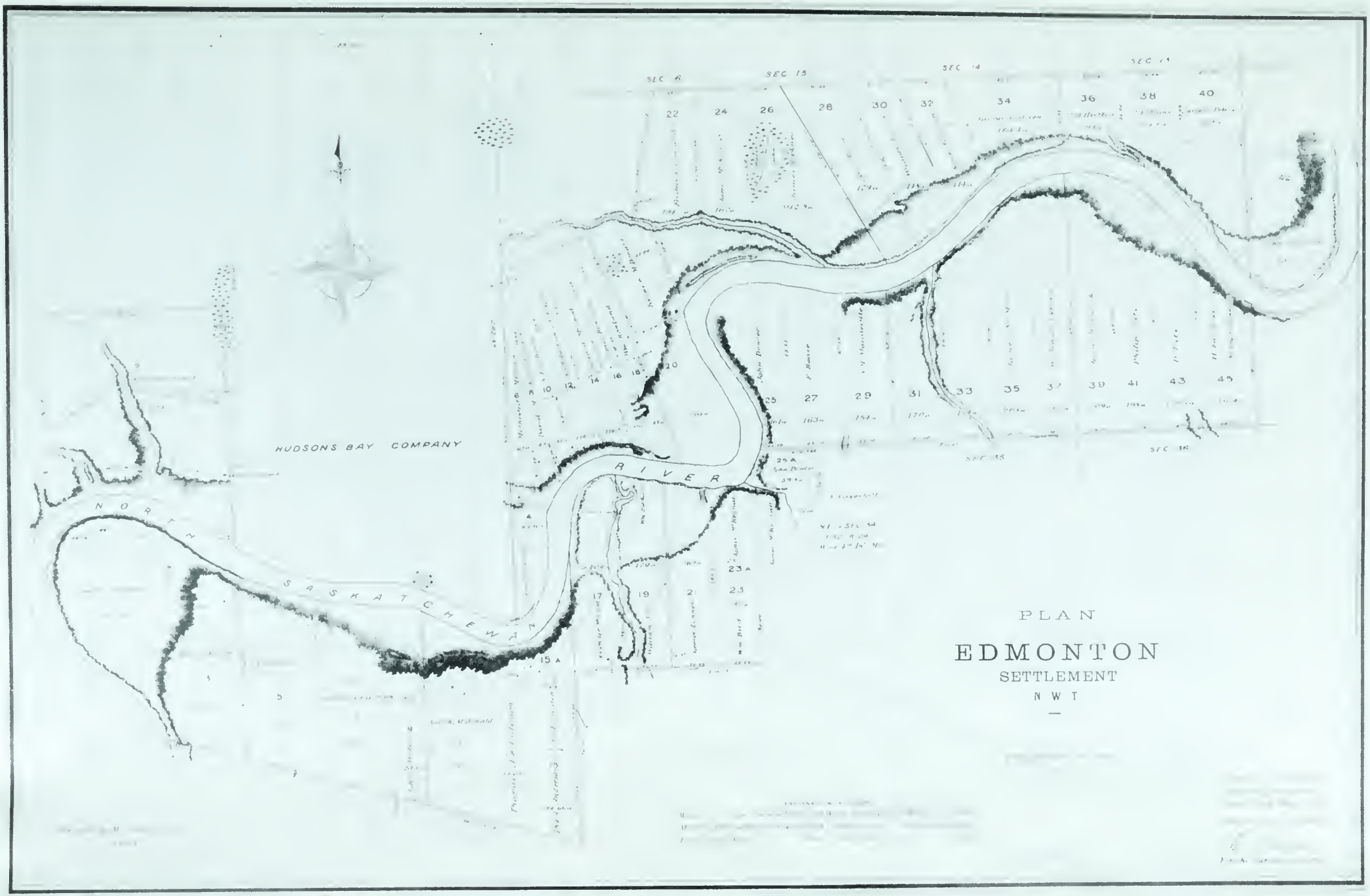


Figure 1. A photo-copy of the first settlement plan of Edmonton after M. Deans, D.L.S., 1882. Source: Director of Surveys, Government of Alberta.

of the river in establishing the river lots is easily recognized. Although many of the river lot boundaries appear lost in the present grid system of Edmonton, several survive. In particular, University Avenue in Edmonton's south-west area will be recognized as the back-line of Deane's traverse parallel to the river.

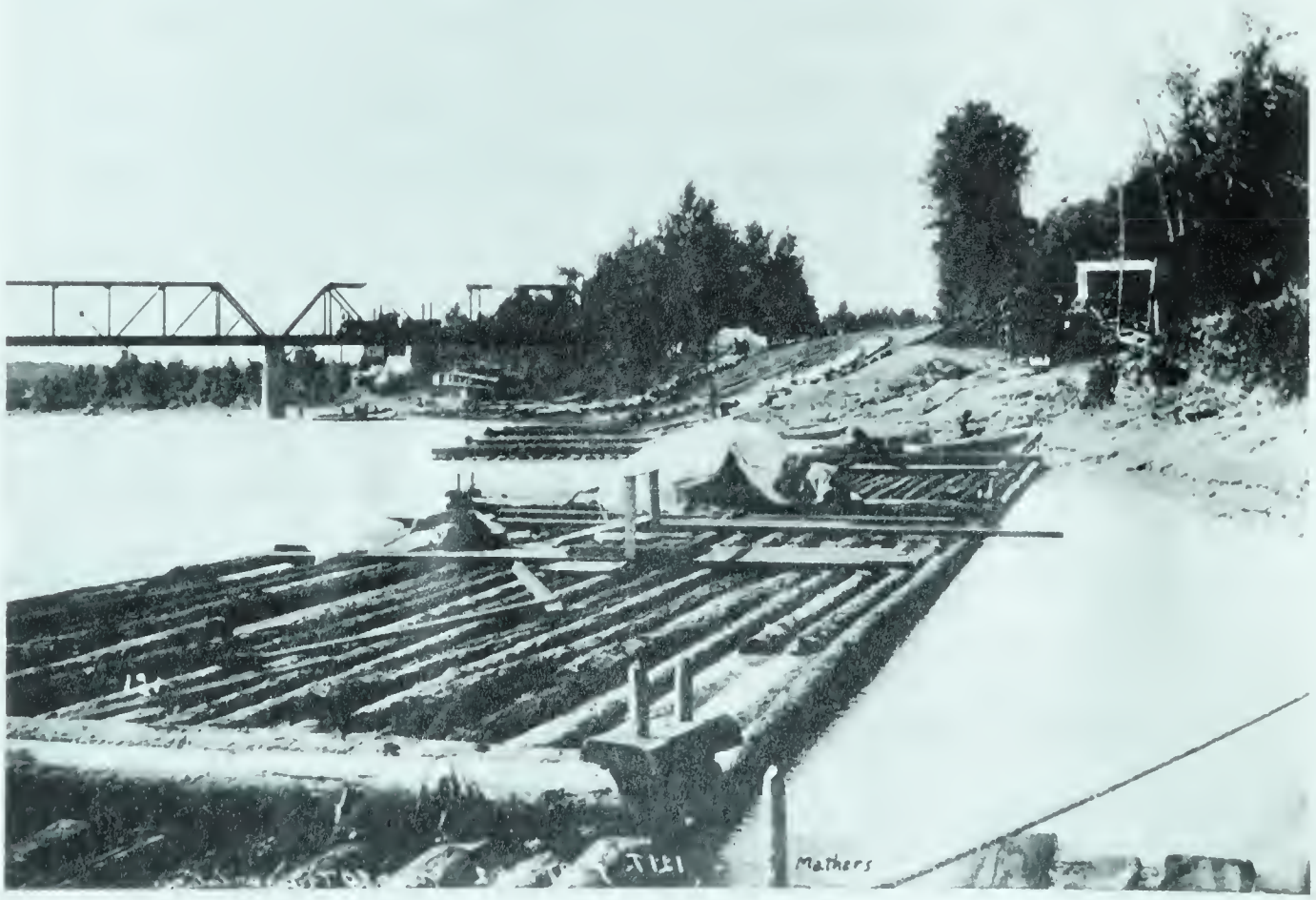
The field notes of Deane and another early surveyor, Walter Beatty, provide excellent source material in connection with the human and physical problems of Edmonton's first settlement survey. (These notes are presently under the protection of the Director of Surveys for the Alberta Government.) Deane was directed to make the Edmonton survey because of the increasing conflicts arising from a lack of legal river lot boundaries. Without these legal boundaries, the settlers quarreled continually over the rights to particular physical assets including firewood and an easy access to the river ford located in the approximate area of the present 105 Street Bridge. Once the survey plan had been issued, the defined boundaries provided the legal limits of property and the rights within these limits were provided for by the local government.

Subsequent to the Deane plan, Edmonton's industrial land use pattern began to develop rapidly. The lumber operations of John Walter and John Fraser took on new prominence. Located on river lots 9 and 28, these operations provided lumber for the building of the first sided houses erected in Rossdale, Walterdale, Riverdale and Cloverdale. The latter two communities are still located in lots 19, 20 and 21. In addition to housing, the lumber was used for the construction of ferry boats and barges used for the movement of freight and passengers on the North Saskatchewan. The photograph on page 4 shows such a ferry and Walter's

1. The above scene shows the earliest Ferry in Edmonton—Walter's Ferry—and moving freight by barge. (about 1895) Photo by Mathers.
Courtesy R. MacLeod, Edmonton

2. Edmonton from Dowler's Hill in 1907 shows D. R. Fraser's Lumber Mill in the foreground and G. B. Little's Brickyard—early forms of industry. Photo by Mathers.
Courtesy R. MacLeod, Edmonton

3. Fort Edmonton in its final location, showing the Palisades and Bastions overlooking the Saskatchewan River as photographed in 1870. Courtesy R. MacLeod, Edmonton



4. Large reserves of timber in the area resulted in a lumber industry in the district, as the early photograph shows. The rafts were built for transportation down the river. (ABOUT 1907)

Courtesy R. MacLeod, Edmonton

mill is in the background as it appeared about 1895. Timber for Walter's mill was rafted from upstream in a manner indicated by the photograph on page 5.

While Edmonton was a growing valley community on the north side of the river, Strathcona was a growing center on the south bank, the principal communities of which included the aforementioned Cloverdale and Walterdale. The arrival of the railroad from Calgary to Strathcona in 1885 greatly enhanced the economic opportunities of Edmonton's rival. The river began to diminish in importance from this time as the chief means of hauling cargo. Walter made use of this new transportation resource. Lumber was shipped to points as far south as the present city of Wetaskiwin as it was required for the building of farm homes in particular. Strathcona continued to grow because of the rich agricultural land to the south and served as its service center. However, in 1902, the Calgary-Edmonton railway link was completed. From this time, Edmonton grew more rapidly than Strathcona until the amalgamation of the rival centers in 1912.

In the latter part of the 1890's, the Edmonton valley settlement area grew rapidly with more housing and new industries. Following the selection of Edmonton as the capital of the newly formed province in 1905, the land use pattern of the valley changed considerably. The newer houses being constructed to replace the older shacks of the valley flats were built with brick foundations. These bricks were produced locally at Pollard's brick works from clays found in a small area beneath the present High Level Bridge on the south side of the river. The first city power plant in 1905 was constructed largely of bricks from the Pollard works.

The old Terrace Building located just north of the 105 Street Bridge and constructed in 1908 was built largely of bricks produced locally at Pollard's and G.B. Little's brickyards. Little's brickyard was located in Riverdale and is shown on page 4 as it appeared in 1907.

The year 1912 was an important one. In that year, the present Parliament Buildings were officially opened and the High Level Bridge was completed. These two developments were but a part of the changing valley scene. With one exception each of the lower terraces had become quite extensively developed. The exception was the area controlled by the Hudson's Bay Company as shown on Deane's map. Houses were being built on the hillsides and on the plain above. Jasper Avenue in the area of 101 Street had previously developed from a cart track and was now being commercially developed. From 1912 onward Edmonton could no longer be called only a valley settlement. Where once there had been a commercial, industrial and residential land use pattern within the valley, there was now only an active residential pattern with the vestiges of the earlier lumber and brick industries. The larger stores were moved to the upper plain to be more convenient to the residential districts which had already expanded out of the valley. The boom period had resulted in a year end population of 53,611, following the amalgamation of Edmonton and Strathcona. Recreational land uses of the valley during this period are described in Chapter II.

The non-recreational land uses of the valley in 1912 are not too different, in terms of area, from those of today. The lumber mills and Pollard's brick works are gone, but the residential areas continue to dominate the larger terraces of the central area. The only exception is

the golf course on the old Hudson's Bay property west of the High Level. Agricultural land uses still exist in the valley as they did prior to 1912. The foremost cultivated areas were located just west of Whitemud Creek on the south side of the river and on the north side terrace immediately upstream from the Beverly Bridge. These areas can be seen most clearly in figure 18. In 1912, however, these areas were not within the city limits as they are now.

Table I illustrates the population growth of Edmonton that accompanied the evolution of the earlier land use pattern from one of industry, commerce, government services and residential uses to that of the present residential and recreational land uses which dominate the area. Figure 2 illustrates the major reasons for the almost continual increase in population from 1899 to 1964. Two periods of increase stand out on the graph and have affected the land use pattern. The real estate boom based on the regional centrality of Edmonton as a service center for the northern half of Alberta reached a peak in 1914. Then, with the coming of World War I and the loss of the required investment capital, the boom collapsed and many of the residential projects of the valley rim were discontinued. Not until the discovery of oil at Leduc in 1947 did the economy and the population really make the great advances for which Edmonton is now well known.

EDMONTON POPULATION 1899 - 1964

POPULATION IN THOUSANDS

0 50 100 150 200 250 300 350

1890

1892 EDMONTON TOWN INCORPORATED

1899

1900

1902 FIRST BOOM & R.R. TRAIN

1905 EDMONTON MADE CAPITAL OF ALBERTA

1910

1914 WORLD WAR I - END OF BOOM

1920

1924 RECESSION

1930

1939 WORLD WAR II - 2 ND. BOOM

1940

1947 OIL & GAS BOOM

1950

1957 END OF 2ND BOOM

1960

1964 AMALGAMATION WITH JASPER PLACE

1964

Source: population figures from Dom. of Canada Census

Figure 2

TABLE I - CITY OF EDMONTON POPULATION, 1899 - 1964

YEAR	POPULATION	YEAR	POPULATION
1899 (Edmonton only)	2,212 C	1938	88,887 C
1901 Edmonton and Strathcona	4,176 D	1939	90,419 C
1903	6,995 C	1940	91,723 C
1906	14,088 D	1941	93,924 C
1909	27,000 C	1941	93,817 D
1911	31,064 D	1942	96,725 C
1912	53,611 C	1943	105,536 C
1913	67,243 C	1944	108,416 C
1914	72,516 C	1945	111,745 C
1915	59,339 C	1946	114,976 C
1916	53,846 D	1946	113,116 D
1917/1919	------	1947	118,541 C
1920	61,045 C	1948	126,609 C
1921	58,821 D	1949	137,469 C
1922/1923	------	1950	148,861 C
1924	63,160 C	1951	158,912 C
1925	65,378 C	1951	158,709 D
1926	65,163 D	1952	169,196 C
1927	67,083 C	1953	183,411 C
1928	69,744 C	1954	197,835 C
1929	74,298 C	1955	209,353 C
1930	77,557 C	1956	223,549 C
1931	79,059 C	1956	224,003 D
1931	79,197 D	1957	238,353 C
1932	78,387 C	1958	252,131 C
1933	79,231 C	1959	260,733 C
1934	79,773 C	1960	269,312 C
1935	82,634 C	1961	276,018 C
1936	85,470 C	1962	294,967 C
1936	85,696 D	1963	303,756 C
1937	87,034 C	1964	357,696 C

C - Civic Census
D - Dominion Census

Figures in the above statement are compiled from the best available sources of information, combining the return for Edmonton and Strathcona, and also including the Villages of North Edmonton and Calder from the time these were incorporated in the city.

Following the Leduc oil discovery, there were few immediate changes in the land use pattern of the valley. However, from 1950 onward, it was the agricultural land which gave way to new uses. In particular, the market gardens of Walterdale gave way to recreational demands and the land was leased to the Kinsmen for development in 1953. Also, in 1955, the area now known as Mayfair Park was considered for development. As a part of this consideration, revenue from gravel hauled from the pits of the area made it possible to finance the first stages of the park complex, construction of which was commenced in 1963. Land in the westerly city limits adjacent to Whitemud Creek, long used for agriculture began to give way to suburban residential use. Private recreation presently exists on the west side of the creek, while on the east side, an active recreation program is operated during the summer as part of the Whitemud complex.

Since the late 1950's, several changes in the residential land use of the valley have taken place which effect recreation to some degree. Large residential tracts suited to suburban living have given way to higher density areas such as the Capilano district on the south-eastern edge of the city. Also, several areas of older homes are still in the process of change to newer forms of residential use. These include the high-rise area from 101 Street to 124 Street on the north side of the river. Although they are attractive in their own right, it might be a questionable point as to their affect on the aesthetic attractiveness of the valley.

In the nearly 150 years of continuous settlement of the North Saskatchewan River Valley, there have been significant changes in the non-

recreational land use pattern. The evolution of the land use has progressed from one of agriculture to one of residential and recreational, if acreage is the main criterion. Where once a settlement depended on the industry of the valley, it is now more dependent on the upper plain for its economic strength. Some of the governmental and commercial aspects of the upper plain are shown as they appeared in 1962 in the photographs on page 12. Each of these settlement aspects, formerly located in the valley, was forced to move to the plain above as the settled area expanded. Some essential services are still located in the valley. These include the power, water and sewer systems located in several areas, chief of which is the old fort site at the north end of the 105 Street Bridge. It would appear that future changes will occur most noticeably in the older residential areas of Walterdale, Rossdale, Riverdale and Cloverdale. The majority of the houses in these areas are old and must soon be replaced, perhaps by suitable additions to the present recreational complex of the valley.

The Government Center – 1962

5. Courtesy R. MacLeod, Edmonton

The Central Business District – 1962

6. Courtesy R. MacLeod, Edmonton

CHAPTER II

RECREATIONAL LAND USE IN THE NORTH SASKATCHEWAN RIVER VALLEY

The recreational use of land is dependent on population. In Table I of the preceding chapter, the rapid growth in population for the years 1911 onward is very noticeable. Of particular importance is the growth in the active age range of from 5-45 years. This 40 year range is considered by A.V. Pettigrew, the Assistant Superintendent of the Parks and Recreation Department for the City of Edmonton, to be the age limits for active recreation. It is this active group as set out in Table II which requires the majority of space in their recreational pursuits such as golf, football and skiing.

In the years from 1916 to 1921, there was a decided decrease in the percentage of persons within the active age group. This was brought about by the greater numbers of persons that are living to an increasing old age. However, this decrease in percentage is greatly offset by the absolute increase of nearly 155,000 persons for the 45 year period. This increase in an active recreation population provided the impetus for the establishment of an early administrative structure to govern and foster the growth of parkland.

A Summary of the Edmonton Parks and Recreation Administration and the Land Areas Involved

The rapid growth of Edmonton from village status in 1871 to a city in 1904 brought increasing departmentalization of the necessary functions of local government administration. By 1906, Edmonton had a population of 14,000 and the City Council had designated 294 acres of municipally owned land for parks purposes, some of which was in the river valley. In 1911, a Parks Board was formed to administer the growing parks and recreation

TABLE II - CITY OF EDMONTON RECREATIONAL AGE STRUCTURE FROM 1916 TO 1961*
WITH EMPHASIS ON THE ACTIVE GROUP

	Total %	1916 (M)%	(F)%	Total %	1926 (M)%	(F)%	Total %	1936 (M)%	(F)%
All Ages	100.00	51.00	49.00	100.00	49.68	50.32	100.00	49.75	50.25
5-9	10.49	5.20	5.29	11.23	5.64	5.59	8.50	4.24	4.26
10-14	8.23	4.10	4.13	11.47	5.69	5.77	9.20	4.51	4.69
15-19	7.57	3.38	4.19	9.26	4.14	5.12	9.81	4.51	5.30
20-24	8.62	3.71	4.91	7.39	3.07	4.32	10.53	4.30	6.23
25-29	10.81	5.32	5.49	6.50	2.81	3.83	8.68	4.00	4.68
30-34	11.32	6.12	5.20	7.71	3.57	4.14	7.11	3.52	3.59
35-39	9.15	5.14	4.01	9.10	4.72	4.38	6.81	3.45	3.36
40-45	6.42	3.60	2.82	8.38	4.65	3.73	6.72	3.45	3.27
	72.61	36.57	36.04	71.14	34.26	36.88	67.36	31.98	35.38

	Total %	1946 (M)%	(F)%	Total %	1956 (M)%	(F)%	Total %	1961 (M)%	(F)%
All Ages	100.00	48.91	50.67	100.00	50.02	49.95	100.00	50.15	49.85
5-9	7.21	3.57	3.64	10.25	5.26	4.99	11.03	5.64	5.39
10-14	6.88	3.45	3.43	6.97	3.51	3.46	8.76	4.47	4.29
15-19	8.21	3.72	4.49	6.43	2.94	3.49	6.80	3.16	3.64
20-24	10.43	4.26	6.17	8.85	3.99	4.86	8.02	3 62	4.40
25-29	10.02	4.57	5.45	9.58	4.87	4.71	8.20	4.18	4.02
30-34	8.64	4.03	4.61	8.89	4.41	4.48	7.96	4.13	3.83
35-39	7.46	3.73	3.73	7.58	3.79	3.79	7.49	3.75	3.74
40-45	5.89	3.03	2.86	6.46	3.26	3.20	6.28	3.12	3.16
	64.94	30.36	34.58	65.01	32.03	32.98	64.54	32.07	32.47

*Source: Adapted from City of Edmonton Draft General Plan, Part II, Chapter III, 1963.

areas. Mayor G.S. Armstrong expressed concern for the administration of the growing parks network in a letter to A.J. Latornell, the City Engineer for Edmonton: "Realizing as we do the great necessity for Parks and Recreation grounds throughout the City, we trust you will accept a position on the [Parks] Board."[1] Latornell subsequently accepted the Board position and appointed P.A. von Aueberg,his assistant, as the first Parks Superintendent in December 1911.

In March, 1912, von Aueberg reported that the total area of parkland was in excess of 800 acres some of which was in the river valley. The following table illustrates the river valley areas that were within the Parks system by December 31, 1912.[2]

TABLE III - THE DATE OF ACQUISITION AND THE AREA OF VALLEY PARKLAND ACCORDING TO VON AUEBERG'S REPORT, DECEMBER 31, 1912

PARKS	DATE OF ACQUISITION	AREA IN ACRES
Groat Ravine	1910-1912	25.3
Laurier	1906	20.5
Rat Creek	1912	95.6
Riverdale	1912	5.3
Mayfair	1912	12.0
TOTAL		158.7

Source: City Parks and Recreation Department

[1] A letter on file with the City of Edmonton, Parks and Recreation Department.

[2] A report of von Aueberg's for the year ending December 31, 1912, on file with the City of Edmonton Parks and Recreation Department.

These and other lands outside the valley were acquired by donation and purchase and through forfeiture for tax arrears. An example of the public spirit that prevailed at this "boom" period prior to 1913 is illustrated by the offer to the city of some 300 acres in the upper Whitemud Creek Valley, a gift which was not accepted because of the roughness of the land deemed unsuited to the recreational needs of the day. However, the Parks Superintendent was in many ways ambitious and far sighted. Morele and Nichols, a firm of landscape architects from Minneapolis, were engaged to design some of the city parks. The Municipal Golf Links (now Victoria Golf Course) and the Cricket Pitch, were established in the valley under the guidance of the firm as were several picnic sites and foot and bridle paths.

When the land boom collapsed in 1913, however, the short-lived Parks Board collapsed with it. By City Council resolution of August 21, 1913, all management and maintenance of parks reverted to the Engineering Department. The subsequent decades of war and depression only added to the difficulty of re-establishing a parks and recreation department, though extensive new areas were added to the valley recreation pattern. These included the Highlands Golf Course, Renfrew, Diamond and Queen Elizabeth Parks. Other areas which were not developed for residential or commercial undertakings due to the physiography were classified as parkland. While used more in summer, some of this land began to be considered as significant parkland through its use for skiing. Due mainly to the strong influence of two prominent ski clubs, the Edmonton and the Eskimo, located in the Connors Hill and Whitemud areas respectively, slope areas in particular became recognized as valuable assets in a growing recreational movement.

In 1944, a Recreation Commission was established to carry out the "activity" aspect of Parks and Recreation on grounds and other facilities still managed by the Engineering Department.[3] In 1947, a Parks Department was recreated with A.C. Patterson as the new superintendent. At this time, public recreation areas were maintained and developed by the Parks Department and programmed by the Recreation Commission. By 1947, over 2,000 acres of land were involved in the parks and recreation complex, most of which were in the river valley in the form of golf courses and playing fields; uses well suited to the parkland scene.

Further improvements of the Parks and Recreation programs came after the appointment of A.Pettigrew and J.R. Wright as Superintendents of the Recreation and Parks Departments respectively. In 1961, the two departments amalgamated for greater overall efficiency. Presently, Wright is the superintendent while Pettigrew is the assistant.

The City of Edmonton Parks and Recreation Department controls 4,979.95 acres of land within the valley. In addition, there are some 2,050 acres of river area for a grand total in excess of 7,000 acres. By the use of a planimeter the author made the above calculation of the river area and in addition found the total valley acreage within the present city limits to be about 9,532.16 acres, spread over a valley length of about 22.4 miles. The approximately 2,500 acres of valley land remaining are primarily residential, as described in the previous chapter, and are situated for the most part between the Groat and East End Bridges.

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[3] The "activity" aspect involved the organization of individual and group activities to be carried out under the auspices of the City or other agency.

The majority of the recreational land area is for low density use and is only partially developed. Picnic sites, golf courses and the purely passive areas are within this category. Several high density areas, including the Storyland Valley Zoo and the Royal Glenora Club sites, have been well developed.

Figure 3 illustrates the position within the valley of the major recreation areas. It will be noted that they are not concentrated in one particular area. They cover not only the main valley but the Whitemud tributary as well. Only in the easterly portion of the valley is there little evidence of major recreation areas. This easterly area was for the most part acquired with the extension of the city limits on August 17, 1964. It is largely residential, and it is unlikely that much of it will be open to recreational uses in the near future.

Figure 4 illustrates the major recreational uses that are made of the major recreational areas. These uses are many, but chief among them are those suited to summer. It is during the summer that the golf courses are active, as are the playing fields. Other outdoor uses include those of the zoo in Laurier Park, the riding facilities of Rainbow Valley in the upper Whitemud Creek area and several large playgrounds associated with Kinsmen and Whitemud Parks.

Winter recreational uses are confined almost exclusively to slope sports such as tobogganing, and to ice activities such as hockey and skating. Facilities for these activities are evident at many locations, particularly in that portion of the valley from Mill Creek to the Groat Bridge.

Table IV illustrates the total size and the amount of land in connection with each of the major recreational areas. In addition, the facilities offered at each of these eight areas is shown together with the major summer and winter uses. Although boating is indicated for Whitemud and Emily Murphy Parks, there are at present no facilities specifically designed for boating enthusiasts. Instead, each of these areas has a good access to the river and power boat owners can back trailers into the water at each location by using the roadways primarily provided for other purposes. Picnic facilities are offered within each area with the exception of Strathearn which is designed primarily as an active play area.

Most of the parkland within the valley is found on the south side of the river. In fact, there are 3,377.17 acres on the south as compared to only 1,502.18 acres on the north side. The physiography of the valley is partly responsible for this significant distribution. In particular, the north facing slopes are heavily forested, while the bottom lands are less suited to residential development because of their small size and shaded location. In addition, the initial growth of the city started on the north side, and the pattern has remained dominant through the years as far as the valley is concerned.

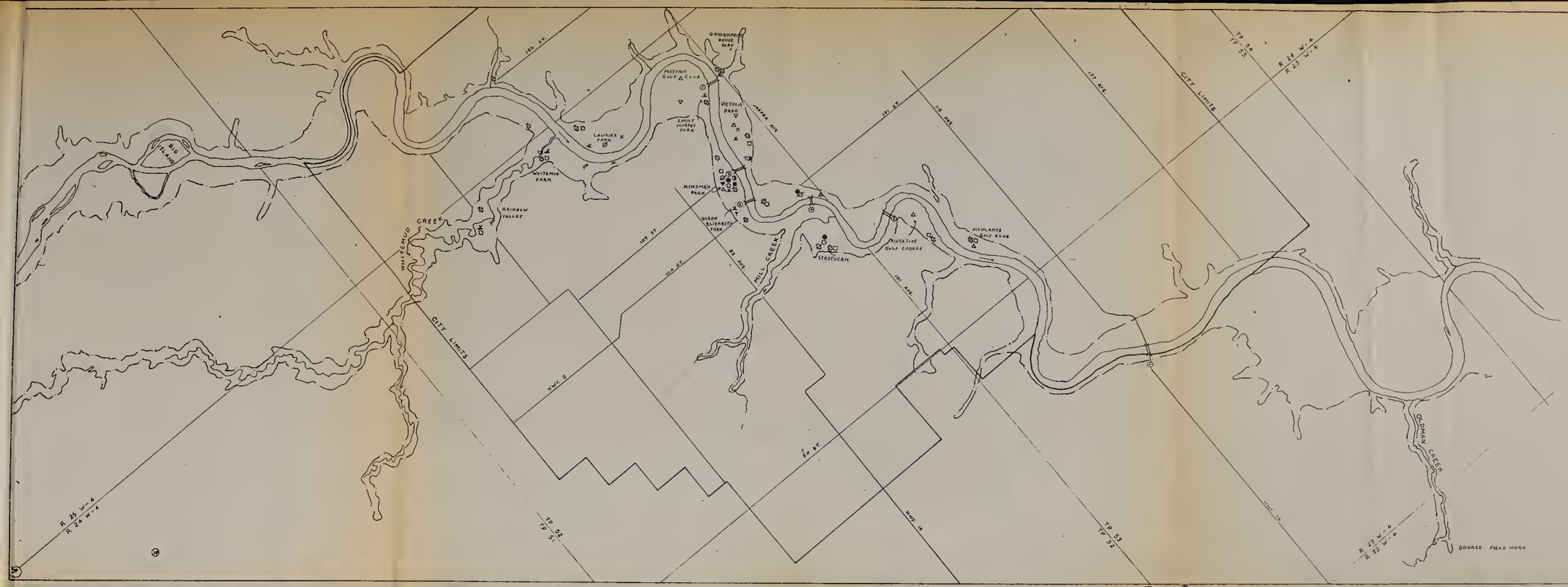
Recreational Activity in the River Valley

During the summer of 1963, the author assisted in a survey to determine the casual visitor use of the city parks areas. In all, 45 areas were considered, eight of which were in the valley. Attendance counts and interviews were taken in each of the valley areas. The days of June, July, August and September were random sampled as were the hours of the day between 9 a.m. and 9 p.m. Four one-hour periods on each of

NORTH SASKATCHEWAN RIVER VALLEY
EDMONTON

MAJOR RECREATION AREAS FEB 15, 1965

FIGURE 3



LEGEND

RIVER VALLEY BOUNDARY
ROAD BRIDGES

1. GROAT
2. HIGH LEVEL
3. 105 STREET
4. LOW LEVEL
5. EAST END
6. BEVERLY

TEAM	INDIVIDUAL
Ø BASEBALL	△ GOLF
∩ CRICKET	⛷ RIDING
▼ FASTBALL	▽ SKATING
■ FOOTBALL	⛷ SKIING
● HOCKEY	Y SWIMMING
○ SOCCER	○ TENNIS
	□ TOBOGGANING

OTHERS

x PICNIC SITES
z STORYLAND ZOO

SCALE 1:50,000
1.25 inches to 1 mile approximately

SOURCE: FIELD WORK

NORTH SASKATCHEWAN RIVER VALLEY
EDMONTON

MAJOR RECREATION USES

FEB. 12, 1965

FIGURE 4

TABLE IV - THE TOTAL AREAS OF THE MAJOR PARKS, THE FACILITIES PROVIDED AND THE MAJOR SUMMER AND WINTER USES THAT ARE MADE OF THEM

Name of Area	Total Size In Acres	Parkland In Acres	Facilities	Major Summer Use	Major Winter Use
Whitemud	397.44	397.44	Playground, picnic, creek, ski hill, River, parking, boat launching, toilets	Playground, Picnic	Skiing Skating
Laurier	111.57	111.57	Zoo complex, picnic, ski hill, baseball, parking, toilets	Zoo, Base-ball, Pic-nics	Skiing
Emily Murphy	65.41	48.29	Picnic, boat launching parking toilets, ski trails	Picnics Boating	Skiing
Victoria	298.38	298.38	Picnic, golf course, golf driving range, cricket, toilets, parking, skating	Picnics Golf	Skiing Skating
Gov't. House	89.14	73.34	Picnic, ski hill, toboggan hill	Picnics	Skiing Tobogganing
Kinsmen	94.63	33.17	Pitch and putt golf, pic-nic, playing fields, grandstand, club house, wading pool, ski hill	Picnics Organized Games Golf, playground	Skiing Tobogganing Hockey
Queen Elizabeth	77.80	55.53	Swimming pool, picnic, parking, toilets, exten-sive walking trails	Picnics Walking Swimming	Skiing Tobogganing
Strathearn	203.15	127.31	Organized games, wading pool, parking, ski and toboggan hill, toilets	Organized Games Playground	Hockey Skiing Tobogganing

thirty days were selected for the survey. A total of 120 counts and/or interviews were gained from each area. Questionnaires were used for the interviews conducted by selected part-time staff. A high degree of standardization was achieved in the overall study.

The significance of the above survey to this thesis was recognized because of the eight major parks in the river valley. For some years it has been possible to calculate with some degree of accuracy the attendance at the golf courses and other organized recreation sites. However, the casual attendance could not be accounted for as there were no membership lists, admissions or other measuring devices through which these figures could be acquired.

For those areas in which an interview was conducted, the following tables illustrate those factors most often mentioned by the casual visitors as the reasons they came to the particular river valley park area. (It must be remembered that this survey did not attempt to cover those persons engaged in organized activity, such as swimming in the Queen Elizabeth pool, or those in attendance at the Zoo because these figures could be gained through other departmental means.) The tables were prepared from the raw data accumulated by means of the 1963 survey. The data was reorganized and shown in percentages.

Table V illustrates the major reasons that casual visitors came to the eight major recreation areas. In all but one instance, convenience and familiarity were listed as the significant factors responsible for their attendance. Convenience was determined by the proximity of the parks to their homes and by ease of travel to the area by automobile. Only Kinsmen Park differed. In this area, the Kinsmen Club have

supplied a great variety of playground facilities. In addition, the playing fields are perhaps the best cared for in the city and when not in use for organized sport, they are often used by casual visitors. Also, reference to Table IV will illustrate the completeness of the facilities. Strangely, the aesthetic attractions offered in each of the park areas appeared to have little bearing on the attendance.

TABLE V - THE REASONS WHY CASUAL VISITORS CAME TO THE MAJOR RECREATION AREAS IN THE NORTH SASKATCHEWAN RIVER VALLEY

	Facilities	Convenience and Familiarity	Aesthetic attraction	Special Events	Curiosity	Undetermined	
Whitemud	31	43	1	6	10	9	
Storyland	12	37	3	36	3	9	
Emily Murphy	25	65	2	--	3	5	
Victoria	17	66	6	--	8	3	
Gov't. House	13	70	1	5	4	7	
Kinsmen	51	30	0	--	7	12	
Queen Elizabeth	27	55	1	12	1	4	
Strathearn	43	51	1	2	1	2	
Average	27	52	2	8	5	6	100%

In Table VI, it is evident that cars were the main medium of transportation as far as the major parks were concerned. However, where there was a playground attached to the park as at Kinsmen, the participants walked. In most cases, these were persons from the adjoining neighbourhood.

In Table VII, the age range of the casual visitors was from 0 to 50 in the case of the major parks, while in the playgrounds it was heavily weighted in favor of children 10 years and under.

TABLE VI - THE MANNER IN WHICH CASUAL VISITORS CAME TO THE MAJOR PARKS AND LARGER PLAYGROUNDS OF THE NORTH SASKATCHEWAN RIVER VALLEY

	Major Parks	Playgrounds Attached to Major Parks
Car	68	7
Walked	25	82
E.T.S.	3	--
Other	4	11
	100%	100%

TABLE VII - THE AGE RANGE OF THE CASUAL VISITORS WHO ATTENDED THE MAJOR PARKS AND LARGER PLAYGROUNDS OF THE NORTH SASKATCHEWAN RIVER VALLEY

	Major Parks	Playgrounds Attached to Major Parks
0-10	42	78
11-18	13	14
19-50	41	7
51+	4	1
	100%	100%

The way in which the casual visitors planned to participate is illustrated by Table VIII. In the major parks, passive participation was slightly favored. This is not surprising when it is recognized that

the age group concerned was nearly one-half adult and that many of the visitors were women with young children to look after. On the other hand, the playground participation was almost entirely active as might be expected with the predominantly young group.

TABLE VIII - THE WAY IN WHICH CASUAL VISITORS PLANNED TO PARTICIPATE AT THE MAJOR PARKS AND LARGER PLAYGROUNDS OF THE NORTH SASKATCHEWAN RIVER VALLEY

	Major Parks	Playgrounds Attached to Major Parks
Actively (to engage in sport, use equipment etc.)	44	81
Passively (walk around, etc.)	56	19
	100%	100%

In Table IX, the frequency of visitation by casuals to the parks and playgrounds is shown. There is a significant difference in the causal visitation habits for the two areas. For example, in the major parks nearly 50 per cent of the casual visitors frequent the park from one to four times weekly, while 42 per cent are only occasional visitors. By comparison, nearly all of the casual visitors to the playgrounds come on the average of three times a week.

TABLE IX - THE FREQUENCY WITH WHICH CASUAL VISITORS CAME TO THE MAJOR PARKS AND LARGER PLAYGROUNDS OF THE NORTH SASKATCHEWAN RIVER VALLEY

	Major Parks	Playgrounds Attached to Major Parks
1-2 times weekly	23	22
3-4 times weekly	23	21
More than 5 times weekly	12	48
Only occasionally	42	9
	100%	100%

From Table X, it would appear that much of the time spent at the major parks and playground areas is controlled to some extent by the between meal period. The average length of stay was 2.4 hours whereas the average length of time between meals is about five hours. If travelling time and other necessities of the between meal period are considered, then it might be expected that the usual duration would not exceed four hours at the maximum. The period of daylight following the evening meal also has a controlling effect on the duration of time spent in each of the areas. Many indoor recreation activities are somewhat guided by this between meal factor including the moving pictures, curling and bowling.

TABLE X - THE LENGTH OF STAY OF THE CASUAL VISITORS IN THE MAJOR PARKS AND LARGER PLAYGROUNDS OF THE NORTH SASKATCHEWAN RIVER VALLEY

	Major Parks	Playgrounds Attached to Major Parks
less than 1 hour	12	15
1 but not 2 hours	21	32
2-3 hours	30	25
3 hours or more	37	28
	100%	100%

In Table XI, a comparison is made of the manner in which casual visitors came to each of the eight major parks. In every area but Strathearn, the car was the chief mode of transportation. Strathearn is within easy walking distance of most of the persons taking part in the recreation of the area. In addition, very few persons walked to Whitemud, Storyland or Emily Murphy parks because these areas are farther away from residential areas. As they are not regularly serviced by the E.T.S., a car is the most convenient method of transportation.

TABLE XI - A COMPARISON OF THE MANNER IN WHICH CASUAL VISITORS CAME TO THE MAJOR PARK AREAS OF THE NORTH SASKATCHEWAN RIVER VALLEY

	Car	Walk	E.T.S.	Other	
Whitemud	90	3	1	6	
Storyland	89	2	1	8	
Emily Murphy	92	5	0	3	
Victoria	83	17	0	0	
Gov't. House	81	11	1	7	
Kinsmen	82	14	3	1	
Queen Elizabeth	70	20	8	2	
Strathearn*	16	78	0	6	
Average	74	20	2	4	100%

* Strathearn is near a large apartment complex within easy walking distance. Also, the Cloverdale community is adjacent to the park.

In Table XII, a comparison is made of the age groups of the casual visitors who attended the major parks. It is significant to note that Emily Murphy and Government House parks draw a somewhat older group of participants than do Kinsmen or Strathearn. Each of the latter parks is more suited to youthful recreational forms with their wading pool influence, a dominant feature.

TABLE XII - THE AGE GROUPS OF CASUAL VISITORS WHO ATTENDED THE MAJOR PARKS OF THE NORTH SASKATCHEWAN RIVER VALLEY

	Children (0-10)	Teens (11-18)	Adults (19-50)	Seniors (51+)	
Whitemud	41	8	49	2	
Storyland	42	9	40	9	
Emily Murphy	27	6	63	4	
Victoria	41	7	45	7	
Gov't. House	33	4	61	2	
Kinsmen	62	4	32	2	
Queen Elizabeth	29	13	53	5	
Strathearn	64	25	10	1	
Average	43	9	44	4	100%

Casual visitors attending the parks participate actively or passively. Table XIII is a comparison of the manner in which these visitors planned to participate. Whitemud, Kinsmen and Strathearn parks were the areas where active participation was more dominant. The facilities offered at these areas are of a more active nature than those of Emily Murphy, Victoria, and Government House where passive recreation is dominant.

TABLE XIII - THE MANNER IN WHICH THE CASUAL VISITORS TO THE MAJOR PARKS OF THE NORTH SASKATCHEWAN RIVER VALLEY PLANNED TO PARTICIPATE

	Actively	Passively	
Whitemud	61	39	
Storyland	48	52	
Emily Murphy	27	73	
Victoria	30	70	
Gov't. House	38	62	
Kinsmen	51	49	
Queen Elizabeth	44	56	
Strathearn	69	31	
Average	46%	54%	100%

Another aspect of the survey was the place of residence of the casual visitors. Eight flow line maps were therefore prepared to illustrate the residential communities from which the casual participants were drawn and the method of transport used to get to the park.

Figure 5 illustrates the areas from which the casual visitors came to Whitemud Park. As Whitemud offers a wide variety of facilities, people came from all of Edmonton with the south side of the river contributing the greatest numbers. Most of the participants came by car because the park is at the south western edge of the city and lacks a convenient bus schedule. The distance from the residential areas makes walking impractical for the most part.

Figure 6 illustrates that by far the largest numbers of casual visitors to Storyland Park are from the north side of the city and particularly from the north central and north west areas. The aspect of convenience and familiarity emphasized earlier in Table V is very evident. Persons living in south Edmonton visit this park less often because of the absence of conveniently located bridges necessary for direct access.

Figure 7 illustrates Emily Murphy Park's city-wide importance in the growing valley centers concerned primarily with picnics. No organized picnic reservations are allowed for this area. For this reason, although it is a relatively new park, it is well frequented by families in particular. Its popularity is enhanced by the convenience of this location adjacent to the south end of the Groat Bridge. In this location, the wide array of picnic facilities are easily accessible from the river roads.

Figure 8 illustrates the casual visitor participation for Victoria Park. It is a recreation area frequented by persons from many parts

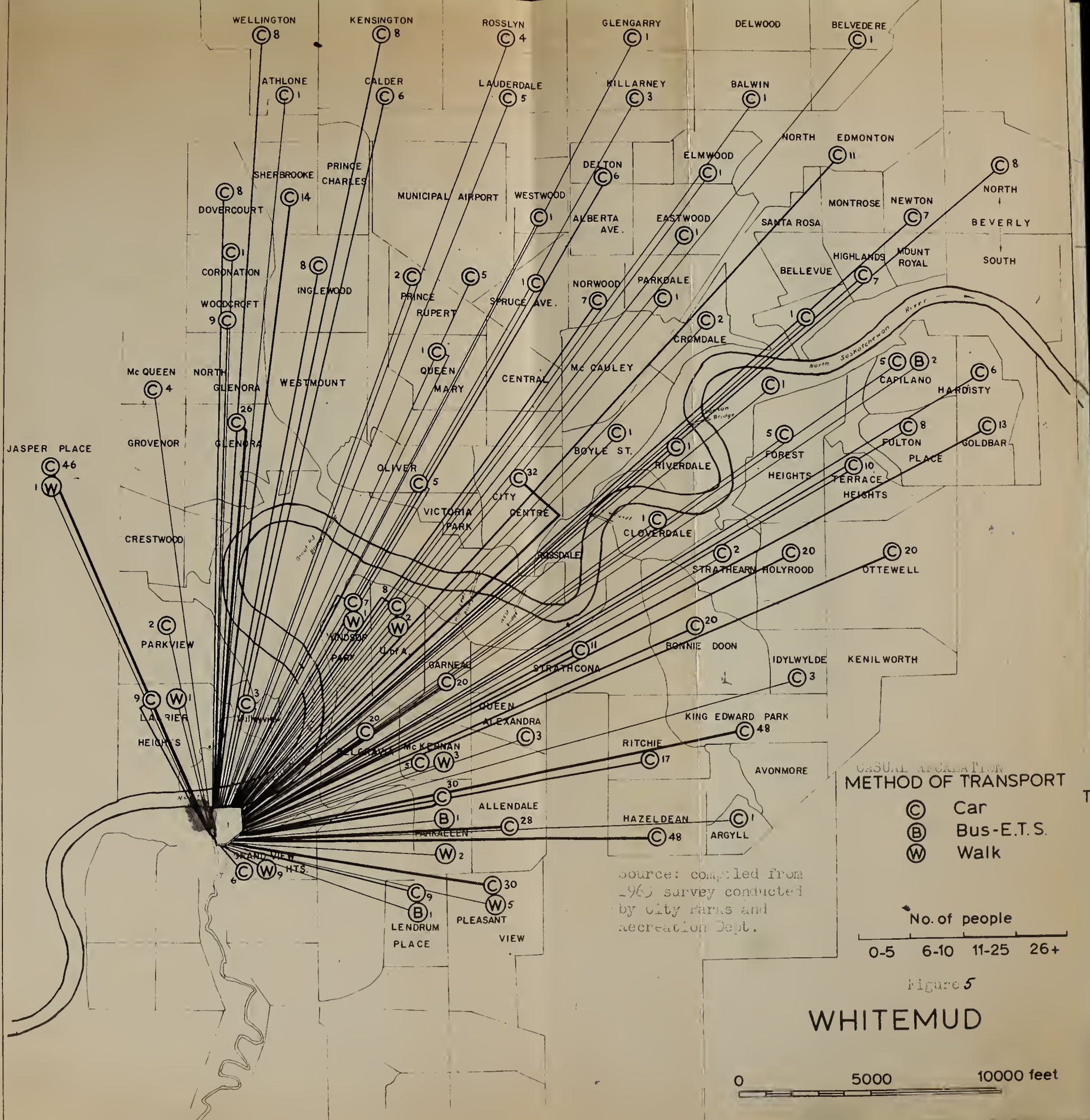
of the city. However, the picnic facilities offered are those most often used by organized groups. It is recognized that the casual visitors, though coming from many areas of the city, were not large in number due to the administrative planning for this park.

Figure 9 illustrates that Government House Park does not draw a great many persons, but those who do visit the area come from widely scattered areas of the city to enjoy the small number of choice picnic facilities that are offered.

Figure 10 illustrates the widespread casual visitor interest that is shown in Kinsmen Park. Although the area offers facilities for organized picnics, games and other activities, it is the casual visitors to the park who account for a large part of overall participation figures. Even with the bus service which is near to the park it is seldom shown as a means of transport to the area. On the other hand, considerable numbers of people walk to the area but by far the largest number come by automobile.

Figure 11 illustrates the casual visitor participation for Queen Elizabeth Park. This park is unique in several respects. It is one of the largest in the city, contains a swimming pool and is well suited to the small family type of picnic. It is therefore of wide interest to Edmontonians desiring a casual rather than an organized recreation period. Within the immediate park area, the method of transport is by car, bus, or foot. However, as might be expected, the casual visitors coming from the greater distances came by car.

Figure 12 illustrates the casual visitor participation for Strathearn Park. The park is not of city wide interest but only of significant use to the persons of the immediate communities. Cloverdale and



CASUAL RECREATION

METHOD OF TRANSPORT

- (C) Car
- (B) Bus-E.T.S.
- (W) Walk

Source: compiled from 1963 survey conducted by City Parks and Recreation Dept.

No. of people

0-5 6-10 11-25 26+

Figure 5

WHITEMUD

0 5000 10000 feet

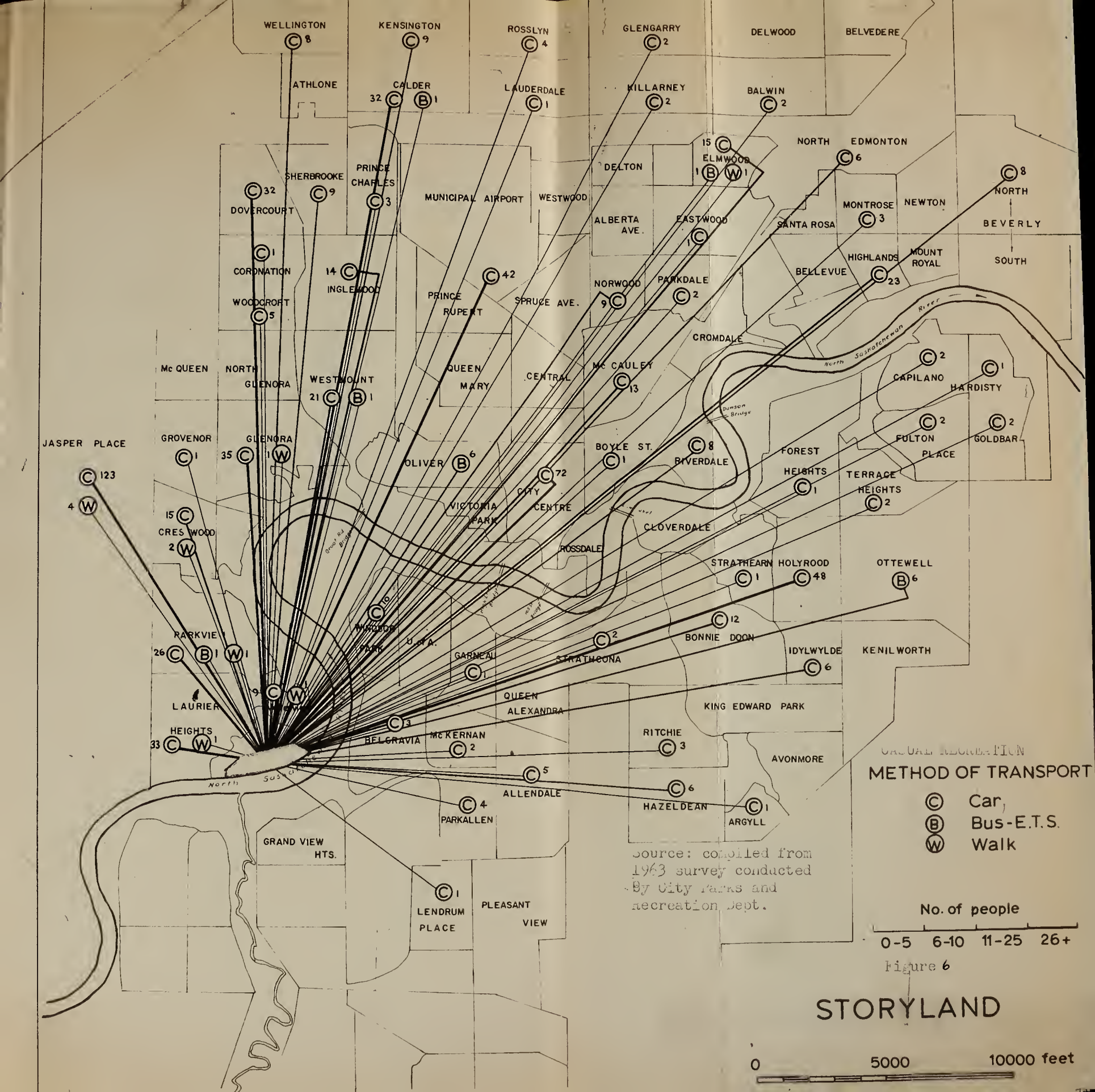
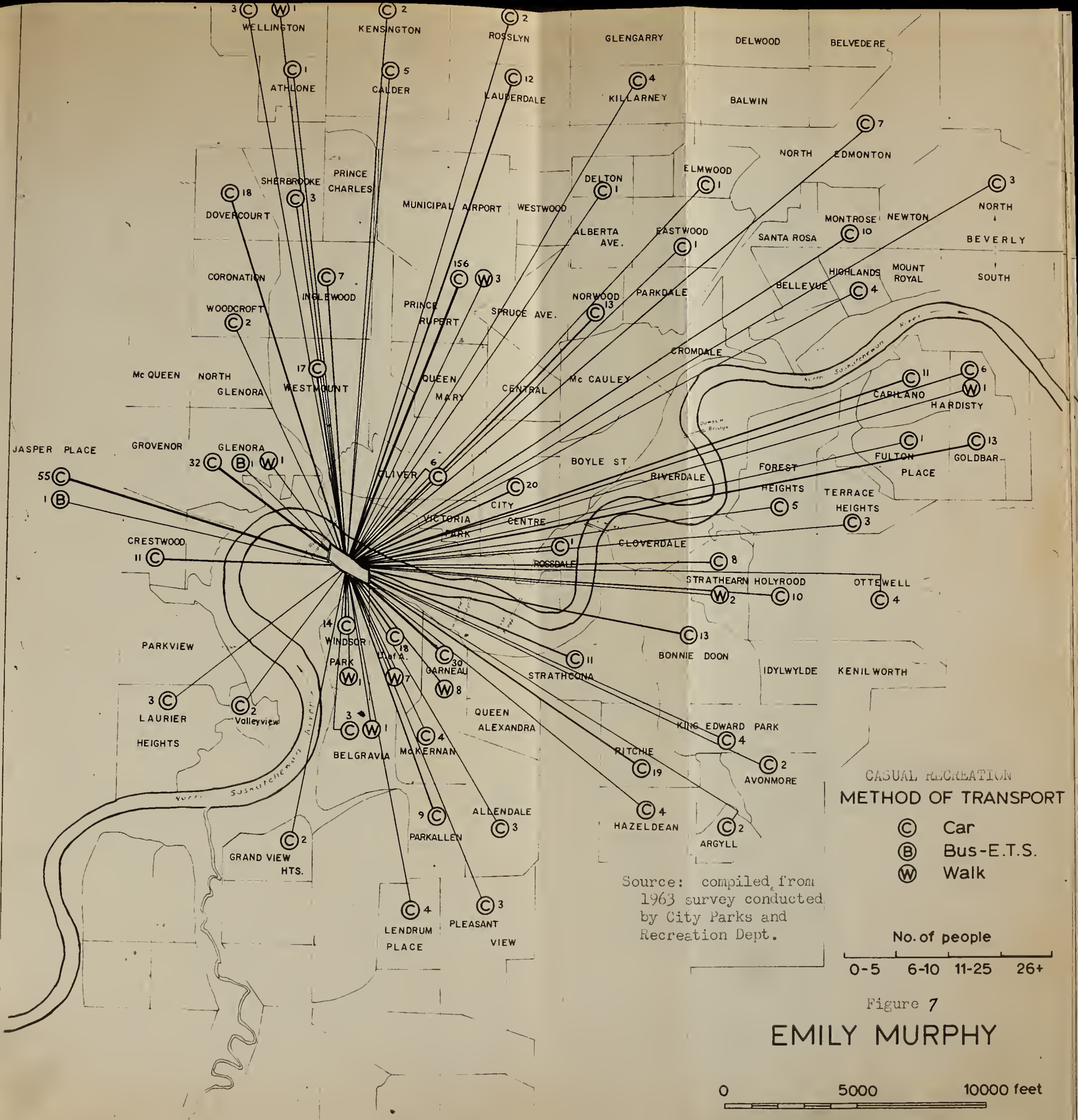


Figure 6

STORYLAND



CASUAL RECREATION

METHOD OF TRANSPORT

- (C) Car
- (B) Bus-E.T.S.
- (W) Walk

Source: compiled from 1963 survey conducted by City Parks and Recreation Dept.

No. of people

0-5 6-10 11-25 26+

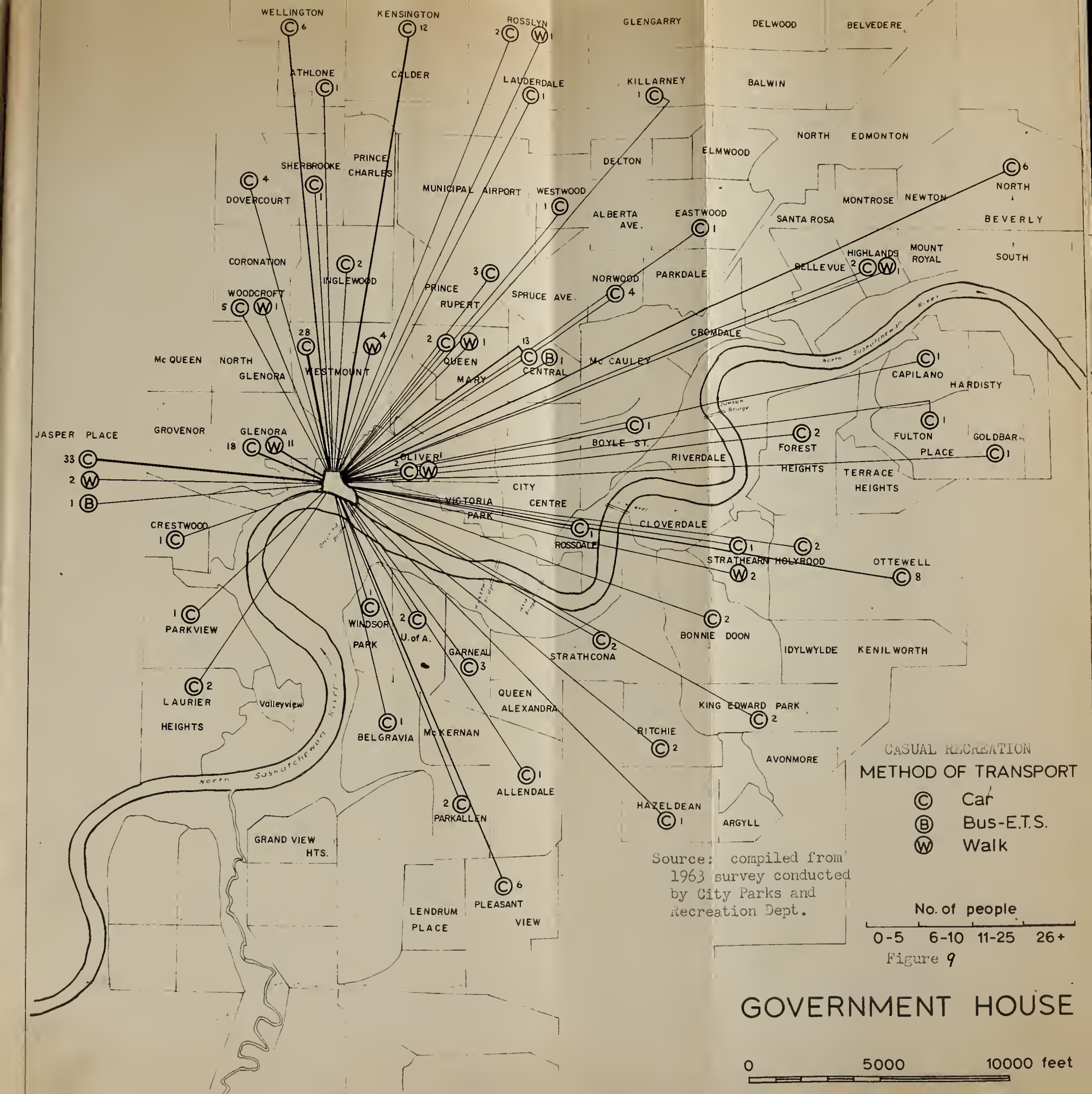
Figure 7

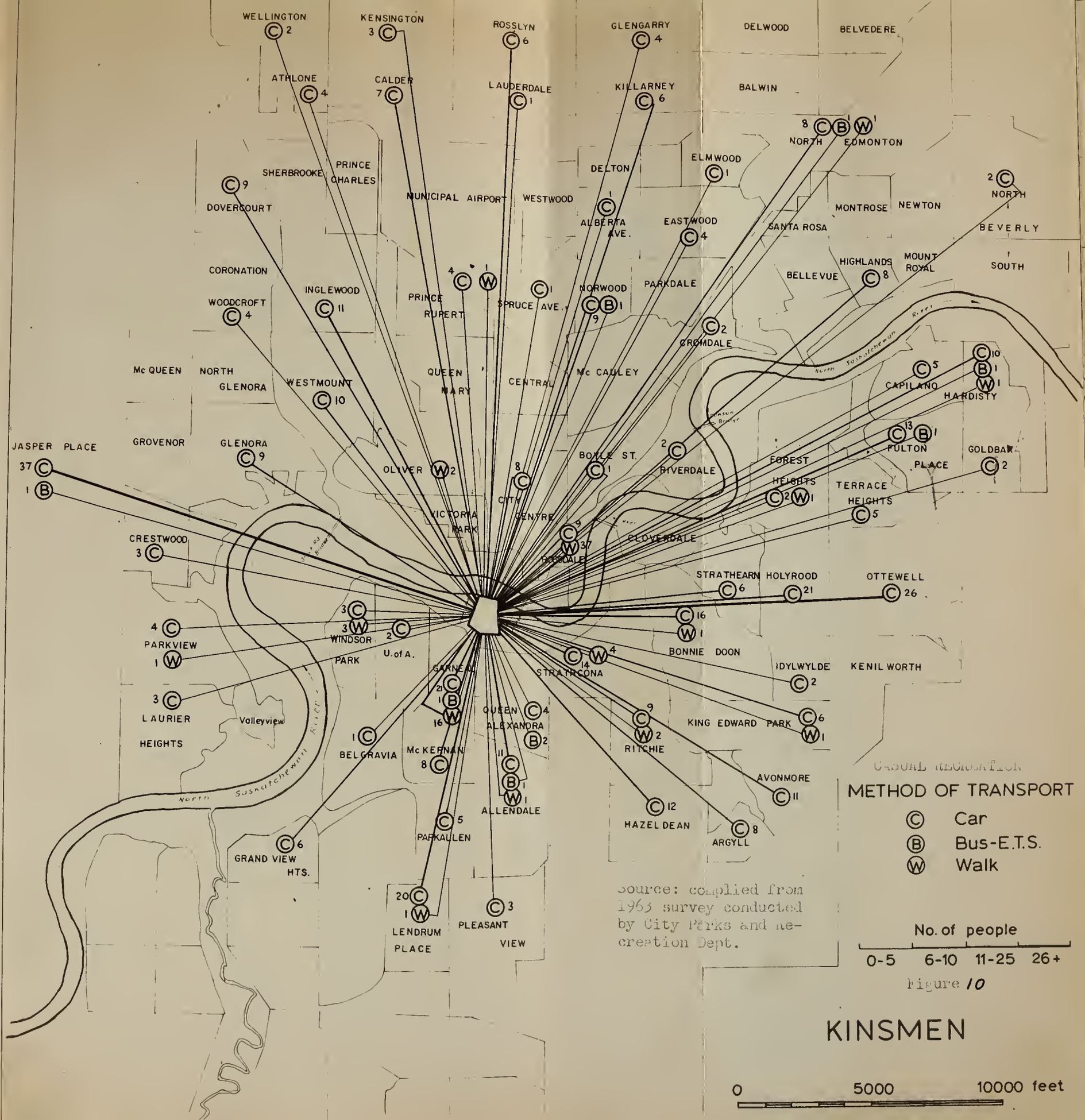
EMILY MURPHY

0 5000 10000 feet

Figure 8

VICTORIA


WELLINGTON
KENSINGTON
ROSSLYN
GLENGARRY
DELWOOD
BELVEDERE
ATHLONE
CALDER
LAUDERDALE
KILLARNEY
BALWIN
NORTH EDMONTON
ELMWOOD
DELTON
SHERBROOKE
PRINCE CHARLES
DOVERCOURT
MUNICIPAL AIRPORT
WESTWOOD
MONTROSE
NEWTON
NORTH BEVERLY
ALBERTA AVE.
EASTWOOD
SANTA ROSA
CORONATION
INGLEWOOD
PRINCE RUPERT
SPRUCE AVE.
NORWOOD
PARKDALE
HIGHLANDS
BELLEVUE
MOUNT ROYAL
SOUTH
WOODCROFT
CROMDALE
Mc QUEEN
NORTH GLENORA
WESTMOUNT
QUEEN MARY
CENTRAL
Mc CAULEY
CAPILANO
HARDISTY
JASPER PLACE
GROVENOR
GLENORA
BOYLE ST.
FOREST HEIGHTS
FULTON PLACE
GOLDBAR
TERRACE HEIGHTS
OLIVER
RIVERDALE
CITY CENTRE
VICTORIA PARK
CLOVERDALE
CRESTWOOD
ROSSDALE
STRATHEARN
HOLYROOD
OTTEWELL
PARKVIEW
WINDSOR PARK
U. of A.
GARNEAU
STRATHCONA
BONNIE DOON
IDYLWYLDE
KENILWORTH
LAURIER HEIGHTS
Valleyview
QUEEN ALEXANDRA
KING EDWARD PARK
BELGRAVIA
McKERNAN
RITCHIE
AVONMORE
ALLENDALE
PARKALLEN
HAZELDEAN
ARGYLL
GRAND VIEW HTS.
LENDRUM PLACE
PLEASANT VIEW
North Saskatchewan River
CASUAL RECREATION
METHOD OF TRANSPORT
Car
Bus-E.T.S.
Walk
Source: compiled from 1963 survey conducted by City Parks and Recreation Dept.
No. of people
0-5 6-10 11-25 26+
Figure 9
GOVERNMENT HOUSE
0 5000 10000 feet



CASUAL RECREATION

METHOD OF TRANSPORT

- (C) Car
- (B) Bus-E.T.S.
- (W) Walk

No. of people

0-5 6-10 11-25 26+

Source: compiled from 1963 survey conducted by City Parks and Recreation Dept.

Figure 10

KINSMEN

0 5000 10000 feet

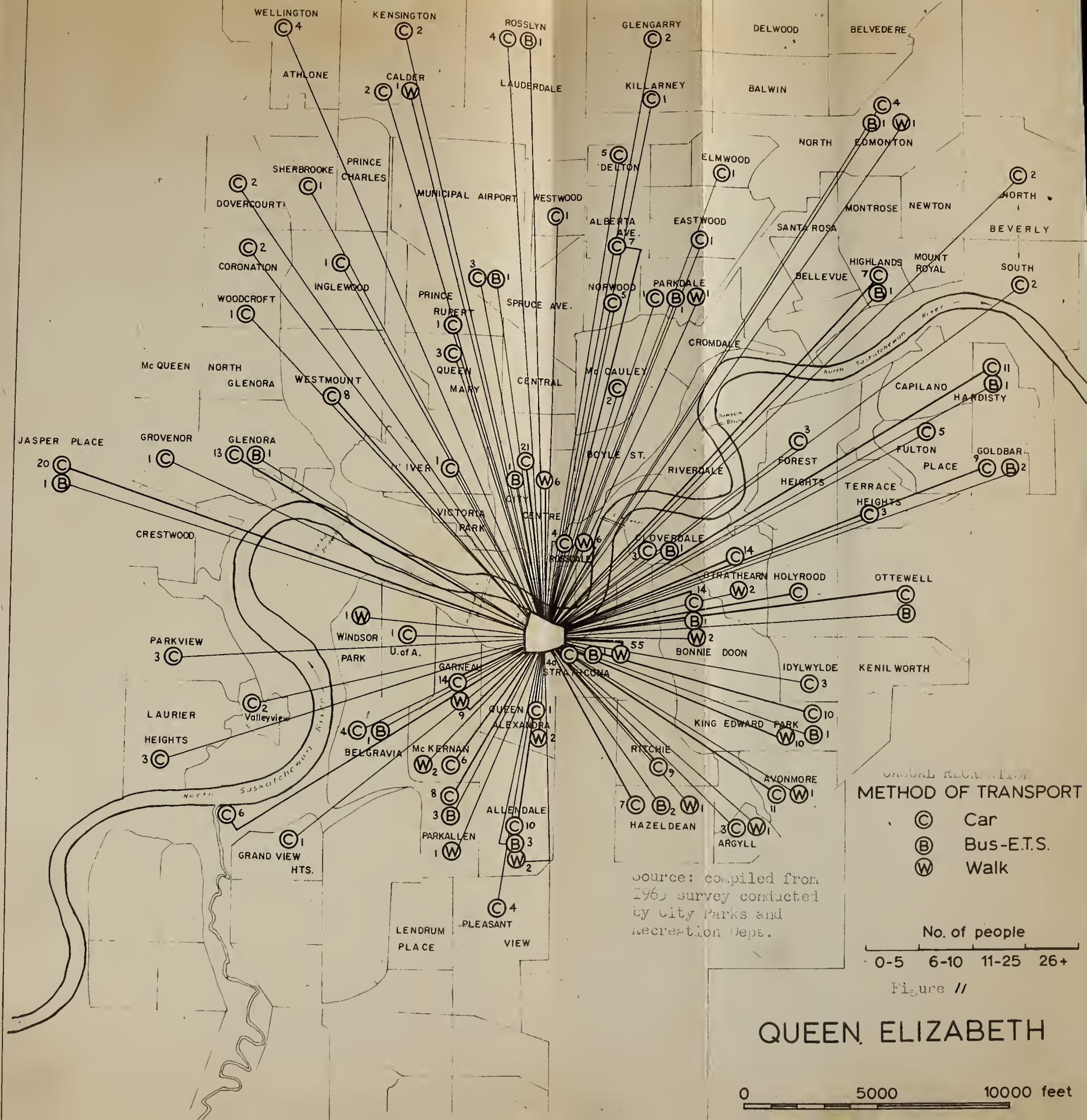


Figure 11

QUEEN ELIZABETH

METHOD OF TRANSPORT

- Ⓒ Car
- Ⓑ Bus-E.T.S.
- Ⓦ Walk

Source: compiled from 1963 survey conducted by City Parks and Recreation Dept.

No. of people

0-5 6-10 11-25 26+

Figure 12

STRATHEARN

0 5000 10000 feet

Strathearn both contribute large numbers to the park and the visitors walk to get there. There are no picnic or other recreational facilities of particular interest to casual visitors of the city at large.

Casual and Organized Recreation in the North Saskatchewan River Valley

In the following statistics, the overall influence of both the casual and the organized recreation for the river valley will be presented. Two ways of equating participation are recognized in the field of recreation. On the one hand there are admission records from which the actual participation can be determined for activities such as golf. Similar statistics can only be approximated for those activities where there is no fee charged. On the other hand, there are membership registrations from which the approximate amount of participation may be determined. This is very difficult and it is highly unlikely that even with the most judicious formula, an "accurate" result could be derived. There are too many variables. For this reason, two types of statistics will be presented: participation where it is believed valid, and membership figures, as with the Edmonton Ski Club and the Royal Glenora Club. Unfortunately, it is seldom known how many different people are involved in a particular activity. Many persons with memberships play occasionally, others play very often while still others do not participate at all. This problem is even more difficult where participation figures are involved. For example, an approximate membership of 50 might be recognized together with a total participation figure for the year of 5,000. It is seldom known, however, if 50 people have taken part 100 times or if 25 people have taken part 200 times.

While the above example might seem extreme, the application is important to the following statistics. The majority of them were compiled

from the 1963 Internal Report of the Parks and Recreation Department. The methods of compilation used are similar in most respects to those used in other urban areas and in agreement with standard practices of the National Recreation Association of the United States. However, such statistics are not infallible but are meant only as an indication of the relative participation for each of the river valley parks areas, public and private.

Generally three sets of statistics are used for the preparation of the tables that follow: those from the 1963 casual visitor survey, those available from the Parks and Recreation Department and those gathered by personal interview from the private clubs and not recorded by either of the other two sources. All statistics are in units of participation unless otherwise indicated. For example, suppose that there are four tennis courts for which figures are required. These courts were in use for 100 days on the average of four hours each day. For one-half of the time, four persons play on each court. The total participation for the season is compiled in the following way according to practise in use by the City Parks and Recreation Department.

100 days x 4 hours daily x 4 courts = 1600 court hours

$\frac{1600 \text{ court hours}}{2}$ = 800 court hours, 800 court hours x 2 persons per court = 1600 units of participation

800 court hours x 4 persons per court = 3200 units of participation.

The total unit participation for the four tennis courts is then estimated to be 1600 plus 3200 = 4800 units of participation.

Table XIV illustrates the total unit participation for the

Whitemud Park complex. Summer participation far exceeds that of the winter participation. However, because of the popular winter facilities, skiers, tobogganers and skaters did use the public facilities in sizeable numbers.

TABLE XIV - TOTAL UNIT RECREATION PARTICIPATION FOR THE YEAR 1963 AT THE WHITEMUD PARK COMPLEX

Casual	14,347
Picnic, Nature Groups, Spectators, Camping, Hiking	38,917
Skiing	1,481
Tobogganing	6,567
Skating	16,940
Model Aeroneers	4,240
Camp Ground (Upper Whitemud) Opened June 1963	4,044
	86,536 Units

Source: City of Edmonton Parks and Recreation Department and 1963 Casual Visitor Survey.

In the Laurier Park complex, the unit participation is heavily weighted by the admissions to the Storyland Children's Zoo. Casual visitors account for a considerable amount of participation by virtue of the spacious grounds along the river well suited to family picnics.

TABLE XV - TOTAL UNIT RECREATION PARTICIPATION FOR 1963 AT THE LAURIER PARK COMPLEX

Casual	21,692
Picnics	10,725
Baseball	3,639
Storyland Children's Zoo	268,888
	304,944 Units

Source: City of Edmonton Parks and Recreation Department and 1963 Casual Visitor Survey.

As indicated by Table XVI, Emily Murphy Park is used primarily as a family picnic area. Although there are small power boats launched from the area, the numbers of persons involved would be quite small. Also, winter participation is quite small as the slopes are not well suited to heavy ski or toboggan use.

TABLE XVI - TOTAL CASUAL PARTICIPATION FOR THE YEAR 1963 AT THE EMILY MURPHY PARK COMPLEX*

Casual	17,747
	17,747 Units

* This park is seldom used in the winter and as there is no caretaker at the park but for the summer months, no other statistics are available. Organized picnics are not permitted at this park.

Source: City of Edmonton Parks and Recreation Department and 1963 Casual Visitor Survey

In Table XVII, the major factors responsible for the heavy unit participation are easily recognized. Within the Victoria complex, the public golf course and the large picnic sites used almost exclusively by very large organized picnic groups account for over one-half of the total unit participation. The golf driving range operated in conjunction with the golf course is the other large contributor to recreational participation.

Table XVIII illustrates the heavy picnic influence that weights the statistics of Government House Park. In addition, many of these in the casual visitor category would most likely have been members of unorganized picnic groups that did not require a permit from the Parks and Recreation Department for the use of the facilities.

TABLE XVII - TOTAL UNIT RECREATION PARTICIPATION FOR THE YEAR 1963 AT THE VICTORIA PARK COMPLEX

Casual	4,209
Picnics	72,275
Golf Course	75,167
Golf Driving Range	38,334
Cricket	7,338
Fastball	4,900
Skating	335
	202,558 Units

Source: City of Edmonton Parks and Recreation Department and 1963 Casual Visitor Survey

TABLE XVIII - TOTAL UNIT RECREATION PARTICIPATION FOR THE YEAR 1963 AT THE GOVERNMENT HOUSE PARK COMPLEX

Casual	10,858
Picnics	32,000
Skiing and Tobogganing	16,000
	58,858 Units

Source: City of Edmonton Parks and Recreation Department and 1963 Casual Visitor Survey.

In Table XIX, the wide range of activity offered by the Kinsmen Park complex is easily seen by the array of factors responsible for the large unit total. In particular, the 18 hole pitch and putt golf course accounted for many participants. This miniature course is heavily used by the inexperienced golfer and by older persons unwilling to play the longer public or private courses. Only one statistic is considered too superficial in terms of the average yearly use, that of the Mardi Gras. It is not conducted at this park as an annual event and is therefore significant for 1963 statistics alone.

TABLE XIX - TOTAL UNIT RECREATION PARTICIPATION FOR THE YEAR 1963 AT THE KINSMEN PARK COMPLEX

Casual	22,072
Soccer	3,530
Hockey	8,848
Fastball	6,105
Baseball	3,960
Rubgy Fastball	12,840
Danish Handball	405
Tennis	14,212
Track and Field	1,250
Volleyball	230
Archery	195
Muk-Luk Mardis Gras	25,800
Pitch and Putt Golf	32,100
Wading Pool	10,195
Picnics	18,475
Archery	1,285
	161,502 Units

Source: City of Edmonton Parks and Recreation Department and 1963 Casual Visitor Survey.

Table XX illustrates only two factors of recreation in the Queen Elizabeth complex, the casual visitors and those admitted to the swimming pool. It is quite probable that some of the casual visitors are also included in the swimming pool statistic.

TABLE XX - TOTAL UNIT RECREATION PARTICIPATION FOR THE YEAR 1963 AT THE QUEEN ELIZABETH PARK COMPLEX

Casual	22,643
Swimming Pool	47,949
	69,592 Units

Source: City of Edmonton Parks and Recreation Department and 1963 Casual Visitor Survey.

In Table XXI, the total unit recreation participation for the Strathearn complex is illustrated. Winter recreation is the major factor. Tobogganing and hockey statistics are shown. However, skiing might well have played a larger role because of the influence of the nearby Edmonton Ski Club whose members frequently used the skiing facilities. There was no statistic available for these persons.

TABLE XXI - TOTAL UNIT RECREATION PARTICIPATION FOR THE YEAR 1963 AT THE STRATHEARN PARK COMPLEX

Casual	9,193
Tobogganing	4,000
Hockey	9,270
Skiing (no statistic available)	
	22,463 Units

Source: City of Edmonton Parks and Recreation Department and 1963 Casual Visitor Survey.

From the statistics of Tables XIV - XXI, it is apparent that there is little correlation between the size of the recreational area and the unit attendance. In particular, it is only another indication that in the overall picture, it is the facilities offered which are of considerable significance for recreation within the North Saskatchewan River Valley. In addition, the unit participation for summer recreation far exceeds that of those activities conducted during the colder winter months. Active forms of recreation such as golf, baseball and fastball account for a very significant proportion of the overall participation. But this is outweighed by the picnic influence which in a somewhat different manner is still largely active. It would therefore appear that the valley has a much heavier use by persons desirous of active recreation than by those

interested in purely passive forms such as photography, walking or just observing others in activity.

There are other recreational facilities of note in the river valley for which statistics are available. They have not been included previously because they do not form part of a particular recreation complex. One group includes city-owned and operated facilities. The other consists of privately owned facilities operated under lease to the city. To follow are the city-owned public operations and the corresponding attendance figures.

In Table XXII, several valley facilities are indicated which do not form a distinct part of any particular park complex. They are in themselves very important to the overall valley recreational scene. Generally, Mill Creek Swimming Pool caters to those persons from the south east part of the city. However, each of the others is of city wide importance. For example, Riverside Golf Course is for public use by golfers and is patronized by persons from all parts of the city. Teams from all parts of the city play organized games on each of the other facilities shown.

TABLE XXII - TOTAL UNIT RECREATION ATTENDANCE IN 1963 FOR FACILITIES THAT WERE NOT A PART OF A PARTICULAR MAJOR PARK COMPLEX

Mill Creek Swimming Pool		62,585
Riverside Golf Course		47,949
Diamond Park: Baseball	4,995	
Hockey	5,145	10,140
Cloverdale: Fastball		8,235
Renfrew: Baseball	15,840	
High School Football	21,640	37,480
		166,389 Units

Source: City of Edmonton Parks and Recreation Department.

In Table XXIII, the size in acres and the 1963 membership statistics are given for eight privately operated clubs located in the river valley. These clubs, unless otherwise indicated, operate on land leased to them by the city. In theory, their privileges can be revoked at any time with due notice to the members. The golf courses in particular occupy very important sites which may, in the not too distant future, be required for public recreation.

TABLE XXIII - THE SIZE AND 1963 MEMBERSHIP OF PRIVATE CLUBS OPERATING UNDER LEASE FROM THE CITY OF EDMONTON

Name of Club	Size in Acres	Membership
Mayfair Golf and Country Club	155	5,200
Highlands Golf Club	111	470
Grierson Hill Golf Range	7.6	No meaningful figure available
Royal Glenora Club	8.65	1,350 (family memberships)
Hill Crest Country Club	2	403 (family memberships)
Edmonton Ski Club	17	2,800
Snow Valley Ski Club	3	385
Leecoll Stables (privately owned)	65	80

Source: City of Edmonton Parks and Recreation Department and by personal interview.

Although the latter private facilities are small in number, they represent a factor that is not entirely complementary to public recreation in the river valley. It is the author's opinion that in the river valley, there will be room for only public recreation, where more people can be offered recreational attractions. At a special meeting of City Council, April 4, 1960, Professor Gordon Stephenson, Head of the Division of Town

and Regional Planning, University of Toronto, stated that "The valley may seem to be big now, but will be very small when the city reaches a million population. The Valley within 10 or 20 years should be turned into park and it is essential that planning be done now."[4] It would seem then, that even now sites such as the Leecoll Stables just east of Whitemud Creek are not serving the public but only a selected few who can afford the riding services provided. Even the Victoria Golf Course, because of its low participation figure in relation to its size and site is suspect. It is probable that all valley sites in the future will be expected to cater to those activities which can provide recreation for greater numbers of people or at an increased density per acre. The rapid rate of Edmonton's population increase, together with the fact that the river valley is centrally located, make it increasingly necessary to provide well-planned recreation areas. Also, the valley offers an environment not available on the upper plain. It is therefore all the more valuable to Edmonton's population, expected by the Research Section, City Planning Department to be about 600,000 persons by 1980.[5]

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[4] Edmonton City Council, Minutes, April 4, 1960.

[5] City of Edmonton Draft General Plan, Part II, Chapter III, 1963, p.169.

CHAPTER III

A GEOGRAPHICAL EVALUATION OF THE PHYSICAL QUALITIES OF THE RIVER VALLEY

There are four basic physical qualities of the river valley that should be considered in a study of the recreation of the area. These are geomorphology, weather and climate, soils and vegetation. Each of these qualities is in part responsible for the recreation that is within the valley and each will in turn partially determine the eventual recreational use of the river valley. The combination of these physical qualities provides conditions important to both passive and active recreation. It is the varying relief, soils and the vegetation which produce much of the aesthetic attraction that the valley offers. Slope sports such as skiing depend on the natural relief of the valley, on the soils which support the vegetation which may obstruct winter sports and on the weather and climate which produce the snow and the microclimates which determine how long it will last. The playing fields are situated on the level terraces where there is a good soil development. The activities conducted on these level areas are possible only through the co-operation of man and nature. Although it is man that maintains the recreation areas, the natural physical qualities are nevertheless essential to recreation in the river valley.

Geomorphology

Edmonton is divided by the North Saskatchewan River. The valley is the dominant break in the plain character of the city. The geomorphology of the valley has played a major role in the development of the city and of recreation.

The river valley within Edmonton is believed to be post-pleistocene because of the Lake Edmonton lacustrine deposits found continuously

on both sides of the valley. Varved or bedded clay lies beneath the river alluvium and is in evidence along sections of the river bank. In composition this alluvium is fine to medium grained sand with some silt, as determined by field work undertaken by the author. In the channel or in close proximity to it, coarse sand and gravel are present. These deposits are termed Saskatchewan sands and gravels and are derived mainly from quartzites and cherts of a Rocky Mountain origin. They can be distinguished from glacial gravels which contain about twenty per cent of igneous and metamorphic materials as a result of ice carry from the Canadian Shield. The latter is found in the plain where it makes up much of the ground moraine. It is most evident in such features as the Rabbit Hill drumlin south of the city.

Within the valley, the sands and gravels reach a maximum depth of sixteen feet.[1] These materials have played a vital role in the construction industry of the city and several quarrying operations are still evident in the valley.

There are several large river meanders within the city. Terracing is evident and it is on these that the early farming took place. Later, residential uses displaced much of the farming. The present Walterdale and Riverdale areas are evidence of this displacement. The terraces are alluvial in origin and were formed by the river at an early period. The terraces consist of stratified sands and gravels overlain by silts and clays.[2] Much of the silt and clay is the result of flood action.

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[1] D.A. Taylor, Detailed Stratigraphy of the Edmonton District, unpublished M.Sc. thesis, University of Alberta, Edmonton, 1934, p.18.

[2] Geol. Survey of Canada, Report of Progress for 1873-74, Dawson Brothers, Montreal, 1875, p.9.

The fine materials of the overspill settle out as the flood waters recede. The remnant materials are evidence of this deposition and show most clearly in the excavations for buildings along the river such as the power plant extension.

The river valley is the result of erosional processes. Bayrock and Hughes have suggested that the valley is young in character. They further state that ice of the Wisconsin age may have reached a thickness of 5,000 feet over the Edmonton area.[3] The melt waters of this glacial period were primarily responsible for the start of the valley in the Edmonton area, although the initial drainage was to the Gwynne Outlet to the south of Edmonton.

The present drainage from the interfluves into the river valley follows several well defined ravines cut during post glacial times. Swamps and lakes on the upland areas necessitated drainage channels to the river. All of the water bodies have since been drained naturally or by artificial means and have frequently been built over. Chief among the ravines are Whitemud, McKinnon, Groat, Mill Creek and Rat Creek. They constitute some of the most important recreation areas, particularly Whitemud Creek.

The river valley is nearly 200 feet in depth. The plain area has an average elevation of some 2,200 feet while the river is at about the 2,025 foot level. From figure 18, Relief and the Channel, it will be be seen that several of the larger meanders undercut the marginal bluffs. These bluffs are very steeply sloping with little or no soil or vegetation cover. They serve no functional recreation purpose. They are too steep to hold snow, and they do not offer even a winter use. Several of

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[3] L.A. Bayrock and G.M. Hughes, Surficial Geology of the Edmonton District, Alberta, Research Council of Alberta, Edmonton, 1962, p.24.

these slopes exceed 40 per cent. One of them opposite the Mayfair Golf Course is said to be 46 per cent according to Mr. Wilson of the Parks and Recreation Department.[4]

On the less steep valley sides, winter recreation is an activity well suited to the form of relief. Slope sports such as skiing and tobogganing are activities of the Queen Elizabeth Park and Kinsmen Park on the south side of the river. While the north side is less desirable because the high sun melts the snow, slope sports are nevertheless important in various areas, including the Victoria and Highland Golf Courses.

There is slumping along several short reaches of the main valley. It does not greatly affect recreation but does affect the upper plain residential and business development. The photograph on page 43 is evidence of this slumping.

There are several large terraces within the river valley. Each of these has some form of recreational development. In particular, golf courses are well suited to them as they are large enough for an 18 hole development requiring a minimum of nearly 100 acres. They offer the variety of slopes desired for public golf in particular. Also, the Storyland Zoo is located on a terrace. The river in each case offers the water required for tame grasses and the necessary utilities. These include sprinkling systems and in the case of the zoo, ponds for ducks and other water fowl.

There is a good distribution of valley flats along the river. These nearly level areas occur on both sides of the river within the city limits. Notably, the larger flats include the areas on both sides of

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[4] Pers. comm. Mr. Bruce Wilson, Edmonton.

7. Slumping caused by fluvial erosion of the river bank.

8. The importance of a parkland atmosphere to the scenic site in the lower right and to the quality residential development on the ridge above.

Whitemud Creek adjoining the river, all of the Mayfair area, Rossdale, Riverdale and Cloverdale.

In summary, the geological and relief characteristics of the valley area are such that an extensive recreation program for metropolitan Edmonton is possible. There are over 9,000 acres involved in this valley network, the majority of which is well suited to some kind of recreational use. There are the slopes required for the slope sports, the terraces used for playing fields and golf courses, and the tributary valleys for riding and hiking trails which have as yet been only partially developed. Slope sports, and picnics are desirable attractions for these areas.

Weather and Climate of the River Valley

It is essential to understand the weather and climate or microclimates of the river valley if the true recreational scene is to be appreciated. According to Blair and Fite, temperature and rainfall are the two most important climatic elements,[5] but other factors such as the sunshine, snowfall and wind are also very important from a recreational standpoint.

Because climate is a long range consideration, based on a great many observations, this section is but an attempt to evaluate the weather and climate in terms of meteorological data gathered for the Edmonton area by the Dominion Weather Office for more than 80 years. There are no weather data gathering stations in the valley. It has therefore been necessary to turn to published research on somewhat comparable valleys

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[5] T.A. Blair and R.C. Fite, Weather Elements, Englewood Cliffs, New Jersey, 1963, pp. 302-339.

elsewhere. These include the Red River at Winnipeg, Manitoba.

The Edmonton Weather Office is located at 53' 35" North, 113' 30" West within the Municipal airfield complex. A 1963 summary as published by them was used to identify those elements of particular concern to recreation.[6]

Temperature in Edmonton varies greatly over the year. July is usually the warmest month, with maxima averaging about 89° Fahrenheit while January is the coldest month with minimum temperature ranging from -23.3° Fahrenheit in 1957 to -57.0° Fahrenheit in 1886 and 1893. The average January minimum is about -35° Fahrenheit.

The temperatures of the river valley will differ somewhat from those of the plain for several reasons. The influence of the river will tend to create a cooling effect during the summer. Where there is open water for nearly a mile below the power plant during the winter, the river will tend to moderate the temperatures of the immediate area. Elsewhere over the frozen part of the river, a general cooling effect is noticed. Temperatures of the valley will vary from those on the plain because of the reduced effect of insolation in the shaded valley. This sheltering effect creates a generally cooler day during the summer and winter in the valley. There is also a cold air drainage into the valley which decreases the temperatures. An increasingly important factor of concern to valley recreation is the "heat island" effect of the downtown district. In summer this is noticeable because it creates somewhat higher temperatures. If the area is already too warm for active forms of recreation

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[6] Meteorological Summary 1963, Long Term Records 1881-1963, Edmonton, Alberta, prepared by the Dominion Public Weather Office, Edmonton.

such as tennis, this additional heat is unwanted. However, over most of the valley, the temperatures are cooler than those on the plain. The valley then, is often more suited to active recreation than the plain where the adverse effects of heat may be detrimental. Many people prefer cooler air in the conduct of activities such as golf and tennis. It is therefore more often possible to find this cooler air in the valley.

For recreation in northern latitudes two elements of precipitation must be considered, rainfall and snowfall. In Edmonton, the annual precipitation averages 18.25 inches of which approximately 13 inches is rainfall. The average annual snowfall is about 53 inches, but it has varied greatly from 30.2 inches in 1948-49 to 90.3 inches in 1906. The annual rainfall also varies greatly. In 1883, there were only 6.27 inches while in 1901 there were 20.69 inches.

Although precipitation is significant to the development of soils and to the growth of shrubs, trees and other valley vegetation, it is not alone responsible for the success of vegetation growth on the playing areas of the valley. Precipitation often has to be supplemented through artificial watering. The golf courses use a great deal of water artificially distributed as do the soccer pitches and other major games areas. Snow on the other hand is very important indirectly and directly to valley recreation. Vegetation benefits from its melt waters. To skiers and tobogganers it is a very necessary commodity. By the very nature of the valley, some major winter attractions stem from the slopes and the snow that covers them. In particular, the north facing slopes offer greater winter slope sport attraction because the snow lasts longer and is of better quality than that of the warmer south facing slopes. In the tributary valleys, the shelter from the sun controls the

snow melt providing very good winter slope conditions. Although most skiing areas are restricted to rough land unsuited for other uses, their location is also determined by the necessity for shelter from the sun. Snow Valley is a good example of such a location.

Unlike temperature, precipitation does not vary greatly between the plain and the valley though the retention qualities are different because of the sheltered aspect of the vegetative cover and the north facing slopes. Vegetation is more dense on the north facing valley side and the playing fields are better able to withstand heavy participation because of this moisture retention advantages. However, grass cutting and some other maintenance duties are hampered on the south side of the river by this moisture. Hubert Edmonds in his study Das Bonner Stadtklima, conducted in 1954, found that humid vegetated ravines experienced the coolest valley temperatures and that this tendency was greater at night than in the daytime.[7] Klassen in his studies of the North Saskatchewan River Valley during the springs of 1958 and 1959, found that the relative humidity was higher in the valley than on the plain.[8] It is the river which is the additional factor influencing humidity within the valley. When the temperature is suitable, a dew will persist on the south side of the valley and in the tributaries long after it is dry on the plain or even the north side of the valley. The higher relative humidity in the river valley is directly related to the vegetation growth which is generally more lush than that of the plain. This has particular significance for the aesthetic appearance of the valley. The winter effects

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[7] Hubert Edmonds, Das Bonner Stadtklima, Bonn, 1954.

[8] W. Klassen, Micrometeorological Observations in the North Saskatchewan River Valley at Edmonton, Edmonton, 1960.

of this humidity are less noticeable. On the ice rinks and the snow surface there is often an additional coating of frost but it is generally of little inconvenience to skaters, tobogganers or skiers.

Although the average annual wind speed of the plain is 8.9 miles per hour and prevailing from the west, there are noticeable differences in velocity and direction within the valley. Winds in a valley are the direct result of thermal activity according to T.A. Gleeson.[9] These winds are greatest during the afternoon when the differential heating of the south and north facing slopes come into play. He further noted that air tends to flow down the shady side of the valley and up the sunny side.

Gleeson also found that daytime winds had an upstream tendency while at night the flow was generally downstream. Although his work was conducted on the Columbia River Valley, the author has noted the same pattern on the North Saskatchewan when using a canoe or other small boat. Therefore, where wind is a detrimental factor, those activities affected could be more successfully conducted in the morning before the winds are an inconvenience.

Although it can not be measured by instruments, the aspect of sensible temperature is very important as it relates to the valley. Recorded as a human feeling rather than by a thermometer, this form of temperature is most favorably noticed during the summer months. Because of the usual air flow within the valley, the "very hot days" are more acceptable, for there is a feeling of coolness not to be had on the upper plain. In the winter the cooler sensible temperature is of little

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[9] T.A. Gleeson, "On the Theory of Cross-Winds Arising from Differential Heating," Journ. of Meteorology, Vol. 10, No. 4, August, 1953, p.262.

consequence in the valley because there is seldom a wind sufficient to create any additional cold.

There is little statistical evidence to support a definite statement on microclimates within the river valley. From the foregoing however, it is believed evident that they do exist. The open water stretch of the river and the smoke pall from the power plant are only two of the contributing factors. The varying valley widths and bank heights also create these differences. These microclimatic variations, however, are generally favorable to most recreational uses of the valley.

From the foregoing material, it is obvious that the valley offers many advantages for recreation that the plain does not. In particular, the cooler temperature of the summer is often more conducive to active games. The Edmonton Husky Junior Football team trains at Kinsmen Park and members have remarked that this coolness is usually conducive to their training.[10] During field surveys in the summer of 1963 and 1964, it was noticed that on very warm days, tennis courts were full in the valley when there was only sporadic play on the plain. This is thought to be another indication of the recreational preference that many have for the valley over the plain. In addition, the higher relative humidity of the valley is not such that it creates an unpleasantness for recreation participants. But, it does create a better vegetation than that of the plain, thus further adding to the aesthetic appearance of the valley. Unfortunately, the author has been unable to discover anything in the way of research material to support a belief that the Parks and Recreation Department is not fully aware of the importance of the weather and climate to recreation in the river valley. If such is the case, then it would appear

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[10] Pers. comm. with team members, Gordon Lund and Paul Brady, Edmonton.

that this valuable aspect of the physical quality of the valley has gone virtually unrecognized.

River Valley Soils

A consideration of the soils in the river valley was undertaken for two major reasons. In the first instance any consideration of recreation within the valley must recognize the importance of vegetation and its various forms. It is therefore necessary to know the underlying soils conditions in relation to the vegetation. Secondly, to encourage recreation within the valley is to expect damage to the vegetation. Therefore, a keen appreciation of the basic soil factors must be known in order to provide adequate maintenance of the vegetation. In tree and shrub replacement for example, or in the selection of a particular slope for winter sports use, the soil characteristics responsible in part for the regeneration of cover must be considered. There has been significant evidence in the past to suggest that the importance of soil to vegetation has not been recognized. For example, a land slide occurred above Victoria Park following road construction because the soil was not sufficiently root-bound to the underlying slope. This slide disrupted activity on the golf course for part of one summer.

The general parent material of all soils in the Edmonton district is Upper Cretaceous bedrock. The uppermost rock formation of concern is the Edmonton Formation described by Bowser et al as "...a brackish water formation composed of bentonitic sandstones, sandy shales, bentonitic clays and coal seams."[11] The effects of Lake Edmonton are to be seen

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[11] W.E. Bowser et al, Soil Survey of the Edmonton Sheet, Report No. 21, University of Alberta, Edmonton, 1962, p.14.

in the additions of lacustrine materials. Although these lacustrine materials play an important role in the soils of the upper plain they are of minor importance to river valley soils.

Because of the scarcity of information on soils of the river valley, field work was undertaken during the summer of 1964. Assisted by Dr. Steven Pawluk of the Soil Sciences Department of the University of Alberta, the author was able to identify major soils within the valley. A map was compiled as a result of this field work and appears as figure 14.

It will be noted that the U.R. or Unclassified Soils cover the greatest area. These soils occur generally on steep slopes where erosion has taken place because of the gradient. Because of the lack of moisture, true soils have been unable to form. These soils support trees and shrubs but will not naturally support grasses which are unable to penetrate surface materials and receive the required water. Only through an extensive artificial watering program are these soils able to support tame or wild grasses.

Soils of the Regosolic order cover large areas of the terraces along the lower valley and the bottom land of Whitemud Creek Valley. In the valley they support arable crops and are especially productive for the grasses and shrubs associated with playing fields and golf courses.

There are two areas of the valley where Chernozemic soils of the Peace Hills variety are found. In each case they are sandy loams. They are found in excessively drained locations and are of coarse texture developed on alluvial aeolian parent materials. They are relatively stone free and support both shrub and tree growth in a natural state. They are not well suited to playing areas because they are found on rolling

land. However, they can be used for golf courses where the participation is relatively light. Their best use would appear to be as undisturbed parkland or low density recreation with little artificial disturbance.

There is one area where a Podzolic soil can be found. This is located just below the Groat Road on the Mayfair Park development. This is a Dark Grey Wooded Leith Sandy Loam. The area is well drained and found on an alluvial aeolian parent material. This Leith soil has a surface layer of loose leaf litter. The soil is suitable for playing areas and will support grass and shrub growth. It is well drained because it is found on undulating ground removed from the usual influence of the river.

Field work indicated that lime was available in all soils in varying amounts, assuring flocculation. This association of soil particles into groups is important to soils where recreational use is anticipated. The developed pore spaces are then available for the storage of the water and air necessary for the continued development of vegetation where heavy use increases the compaction of the soil. This porosity increases the opportunity for root penetration assuring a root mass that can withstand the rigors of winter.

Generally, natural food supply from organic sources is limited by the lack of vegetative cover on the valley floor and there is an overall immaturity noticed in the soils. River valley soils, where used for intensive recreation require the addition of a nitrogenous fertilizer to assure good plant growth. Experience with the parks maintenance system has shown that "Millorganite", a high nitrogen fertilizer, is well suited to soil enrichment. This type of fertilizer will not burn the grass where adequate water is lacking and is ideal for large playing fields and golf courses.

It is expected that the river valley recreational participation will increase. As the playing areas are developed, a recognition of the soils is necessary if the vegetation cover is to be maintained. Such a recognition will allow soil deficiencies to be made up where and when the recreation areas are used.

River Valley Vegetation and Wildlife

Vegetation is a basic component of most outdoor recreational areas, and is important for two significant reasons. The primary benefit is its aesthetic appearance while it is also important as shelter for swimming pools, tennis courts and picnic areas. Although this shelter is important to man, it is also a requirement for the survival of birds, animals and other inhabitants of the woods.

In general terms, the sub-humid continental climate of the Edmonton area has been conducive to the development of grasslands, according to Wyatt, Ward and Newton. However since the 1920s, an increase in annual precipitation together with a moderation in temperature appears to have been favorable to the invasion of a light aspen forest.[12]

In the North Saskatchewan River Valley, the microclimates have produced a significant variety of vegetation contrasts. Figure 15 illustrates both the extent of the major vegetation characteristics and their location. The north facing slopes of the main valley in particular are heavily wooded with few exceptions. These wooded areas have combinations of trees with poplar and spruce the more prominent. Seldom does one species dominate the growth over any area. Instead there is generally a mixture of tree growth as illustrated by the map. However, in those few

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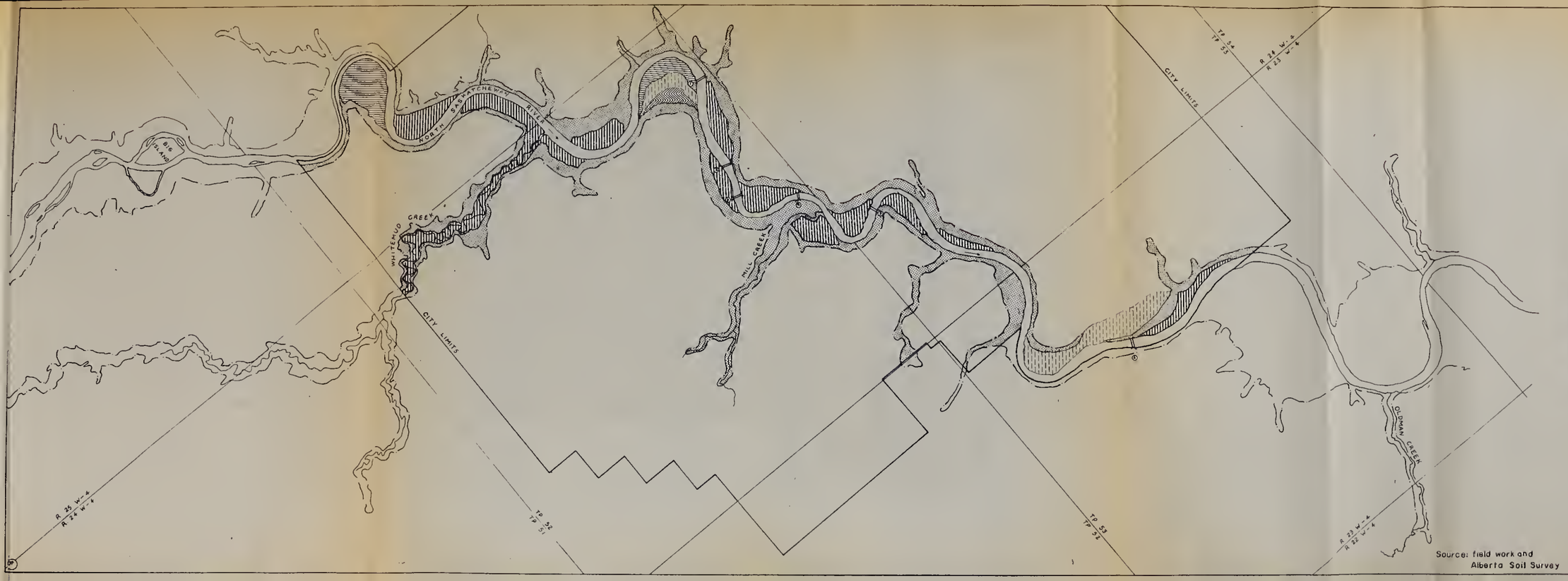
[12] F.A. Wyatt, A.S. Ward, and J.D. Newton, "Nitrate Production Under Field Conditions in the Soils of Central Alberta," Scientifie Agriculture, Vol. 7, 1926, p.15.



N

LEGEND

RIVER VALLEY BOUNDARY
ROAD BRIDGES

1. GROAT
2. HIGH LEVEL
3. 105 STREET
4. LOW LEVEL
5. EAST END
6. EEVERLY

SOIL TYPES

- CHERNOZEMIC-Peace Hills FSL
- PODZOLIC-Leith FSL
- REGOSOLIC-Alluvium
- -Alluvium SL
- UNCLASSIFIED (on rough slopes)

SCALE 1:50,000
1.25 inches to 1 mile approximately

1 0 1 Mile

Source: field work and Alberta Soil Survey

NORTH SASKATCHEWAN RIVER VALLEY
EDMONTON

SOILS

FIGURE 13

areas where soils retain sufficient moisture, white spruce can dominate the vegetation to some degree. Other trees growing on the north facing slopes include paper birch and red dogwood.

By comparison with the north facing slopes, those facing south are usually grass and shrub covered. Such plants as the spear grasses, side oats, gamma grass, snow berry, saskatoon berry and rose bushes are in evidence in varying amounts, primarily dependent on the slope and moisture conditions.[13] These slopes do not have the moisture retention qualities of those on the opposite side of the river because of the sun's influence in particular. The snow melts off the slopes much earlier in the spring and is therefore not retained to the degree in evidence on the north facing slopes.

The tributary valleys containing Whitemud Creek and Mill Creek are generally deep and steep sided. Because of the lack of exposure, they do have sufficient moisture to maintain vegetation and are seldom bare. The shelter offered in these valleys is a valuable recreational asset in terms of present and future picnic sites. They are both located on the south side of the river and extend generally south from it. The water of Whitemud Creek is important to summer and winter recreational forms such as boating, skating and fishing. Mill Creek is little used however. In recent years, drainage normally fed into the creek valley has been diverted to storm sewers. While formerly, some recreational activities such as fishing and skating were to be had, there is little of importance now.

Along the sheltered areas of the valley, the trees are of greater size. This is due to two basic causes. It is known that John Walters and other lumber operators of Edmonton prior to 1920 did little in the way of extensive cutting in the valley within Edmonton. The stands were

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[13] W.C. Wonders, "River Valley City - Edmonton on the the North Saskatchewan, Canadian Geographer, No. 14, 1959, pp. 8-16.

insignificant in size and the timber that was worth cutting was difficult to get at. This increased size is due also to the increased moisture available, as mentioned earlier.

Along the bottom lands of the valley there is little in the way of large trees. Only along the immediate margins of the river is there wooded cover of any size. Instead, there is a considerable amount of shrubs and tame grasses. These areas are associated with the playing fields and golf courses in particular. Reference to the vegetation map will indicate large areas where there is little or no vegetation. These areas are included within the residential sections of the river terraces and as such are not really part of the recreational network of the valley. Also, gravel pits and other disturbed areas have little vegetation.

The vegetated areas of the river valley provide an attractive appearance particularly during the summer. The major picnic areas including Kinsmen, Emily Murphy and Laurier Parks are located within the wooded areas. The shelter aspect is very necessary for this form of recreation and is well cared for by the Parks maintenance staff because of its irreplaceable value. Winter sports such as skiing and tobogganing are conducted in a casual way along the wooded sections of the valley slopes. On the north facing areas, the snow conditions are generally better and the season is considerably longer than on the fast melting south facing slopes. There are sufficient numbers of trails and open spaces among the trees to provide good recreation of this winter slope variety. Particularly good areas include Queen Elizabeth, Kinsmen and Emily Murphy Parks.

The shrubs and grasses associated with the south facing slopes and valley bottom land provide excellent vegetative cover for the margins

of the playing fields and golf courses in particular. They are attractive but do not hinder the operation of active recreation. In addition, there are scattered poplars of large size that increase the attractiveness of the bottom land.

The well wooded areas of the valley provide satisfactory shelter for wild birds and small game animals. Although it is usually only the birds that are seen, the animals are there also. Birds, including the robin and the blue jay attract considerable attention by their presence. The song birds in particular are an important reason why some people seek recreation in the valley. It is only because of the vegetative cover provided that these birds remain.

The small game animals of the river valley include rabbits and squirrels. In addition deer, lynx and the mountain lion of a more primitive area have been sighted in the valley on rare occasions. It is the small game animals however that nature lovers will usually seek and travel the valley to see.

One of the best ways to view and appreciate the river valley vegetation is from the river. The picures on page 57 are indicative of the south and north facing cover.

In addition to the obvious visual and shelter aspects of the vegetation, it has another feature of concern for recreation. Where steep slopes in excess of 35 per cent are bare, they are then liable to erosion. Where the steeper slopes are wooded, this erosion is less evident. Perhaps a program of bank stabilization along the river could be attempted by the Parks and Recreation or another Department of the city. Through the use of shrubs and other forms of vegetation, as along the Groat Ravine, some degree of soil stability has been attained. However, even with a


BIG ISLAND
NORTH SASKATCHEWAN RIVER
WHITEMUD CREEK
MILL CREEK
CITY LIMITS
CITY LIMITS
OLDMAN CREEK
R 25 W 4
R 24 W 4
TP 52
TP 51
TP 53
TP 52
TP 54
TP 53
R 24 W 4
R 23 W 4
LEGEND
RIVER VALLEY BOUNDARY
ROAD BRIDGES
1 GROAT
2 HIGH LEVEL
3 105 STREET
4 LOW LEVEL
5 EAST END
6 BEVERLY
GRASS and SHRUBS
POPLAR
POPLAR - SPRUCE COMPLEX
SPRUCE - POPLAR COMPLEX
CULTIVATED FIELDS
LITTLE or NO VEGETATION
SCALE 1:50,000
1.25 inches to 1 mile approximately
1 0 1 mile
SOURCE AIR PHOTOS, 1962, AND FIELD WORK
NORTH SASKATCHEWAN RIVER VALLEY
EDMONTON
VEGETATION
DATE: OCT. 1964
FIGURE
14

9. Vegetation: Mixed Broadleaf and Deciduous. A Poplar-Spruce Complex on a north-facing slope.

10. Vegetation: A light deciduous growth on a south-facing slope. Note the "slipping" due to slope gradient and insufficient root mass.

vegetative cover, slopes sometimes do erode, slide or slump as witnessed in the pictures on page 43.

Although most outdoor recreation areas have some forms of vegetation, the North Saskatchewan River Valley and its tributaries are favored by a variety and abundance seldom exceeded in valleys of the Prairie Provinces. It is therefore important to continually improve the maintenance program so that this important resource element of recreation will not be diminished.

In this chapter, four physical qualities of the river valley have been considered. These qualities are interrelated and as such, they play a vital role in the recreational use of the valley. It is the varying relief that, in part, controls the development of soils which in part controls the vegetation. The influence of weather and climate is in evidence through the vegetation pattern, controlled in part, by the amount of precipitation that is made available to the various plant forms. It is the integrative aspects of these physical qualities which make the valley such an admirable area for active and passive recreation.

CHAPTER IV

THE RIVER AS A SPECIAL STUDY

The dominant parks and recreational resource within Edmonton is the North Saskatchewan River Valley. Within the valley itself, the river is undoubtedly the foremost physical feature and has great recreational value, both present and potential. In Chapter 1 of this thesis, the importance of the river to the development of the city was stated. However, the chief concern is for the present and future recreational potential of this water body. Considerable investigation was therefore carried out to understand better the character of the North Saskatchewan River. An inspection of the maps will readily disclose the recreational importance of the river if only by reason of its size in comparison to the river valley as a whole. The entire land area of the valley and tributaries within Edmonton is 9,532.16 acres, as measured from the base map using a planimeter. The total surface area of the river is in excess of 2,000 acres. These figures show that the river itself forms an important part of the river valley. The following sections describe the various aspects of the river in an attempt to evaluate its real importance to the Edmonton recreational scene.

River - History of Use

L.R. Voligny credits the discovery of the North Saskatchewan River to the two sons of Pierre Gaultier de Vorennes, Sieur de la Verendrye. In 1741, Chevalier Pierre and his brother Francois entered the river from Lake Winnipeg and journeyed as far as the "forks" by the fall of the year.[1] The "forks" were of course the confluence of the North and South Saskatchewan

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[1] L.R. Voligny, Surveys of the North Saskatchewan River, 1910-1915, Government of Canada, Department of Public Works, Ottawa, 1917, p.227.

Rivers as they are now known. Some forty years later, the Hudson's Bay Company began using the upper reaches of the river in their search of the fur bearing game animals that frequented the immediate surroundings. When the Northwest Company entered the fur trade in 1784, the upstream traffic increased as a result of the search for more abundant fur game areas. When forts were built at Edmonton, the recreational use of the river began because of this settlement influence. Fort employees and the incoming settlers used the river for boating, sledding and fishing during the early years.

From the building of the new Fort Edmonton in 1805 until the coming of the railroad in 1891, the river continued to increase in recreational importance in keeping with the needs of an expanding population. Indeed, after 1891, when the railway from Calgary reached Strathcona, the river lost a great deal of its transport function and became primarily a recreational area. Ice skating was introduced together with horse racing on the ice. Summer excursions in the City of Edmonton, a paddle steamer which cruised between Big Island and Fort Saskatchewan, were weekly occurrences. The photos on page 61 show two of the early river boats that operated in Edmonton. Although this particular river attraction ended in 1914, the canoe continued as a popular means of river travel. As late as 1939, there were three large canoe clubs along the river with over 200 craft in use.[2]

There were few canoes on the river during the war years of 1939-45. Instead, a steadily rising economy coupled with the improvements in outboard motors allowed a great many people to turn to the lakes near

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[2] Pers. comm., John Manson, August-November, 1964. Mr. Manson is an Edmonton "old-timer", having lived in the city since the turn of the century.

11. Early transportation in Edmonton consisted of steam boats on the Saskatchewan and other rivers before the advent of the railways. (about 1900) Courtesy R. MacLeod, Edmonton

12. The "City of Edmonton" travelling along the Saskatchewan River on pleasure trips and moving freight. (about 1911) Courtesy R. MacLeod, Edmonton

Edmonton. At that time, the river appeared too hazardous for power boat owners using the deep draught displacement hulls then in use. Since about 1956, however, the introduction of shallow draught planing hulls has brought some boating enthusiasts back to the river.

Not until the summer of 1964 did the river begin a new "life" of activity centered on surface craft, first with the commercial jet boats of a very shallow draught and trouble free propulsion and then with the introduction of the new 40 passenger Klondyke Queen "stern wheeler" cruise boat. One event in particular which indicated the upsurge in activity was the Klondyke Days water regatta, an event which drew some 60 river cruisers and the jet passenger service in one day. It would appear then, that the river is about to experience a new era of recreational use. However, there is one basic element lacking that could well mean a short duration for this activity. There has been a lack of navigational work done on the river in the Edmonton area. There is therefore the same basic problem confronting many pleasure boat enthusiasts, a lack of channel information. Without recent information on the bars, shoals and other river hazards, the fast new power boat operator is severely handicapped. Safe travel is limited to those operators with experience and only for the deep water period of June and July. It seems likely that if the channel and shallows were marked, the use of the river would increase greatly. To this end, a somewhat crude but nevertheless planned investigation of the channel and general river characteristics has been attempted.

River - Physical Characteristics

The North and South branches of the Saskatchewan River rise at a high elevation on the eastern slope of the Rocky Mountains where they

are fed by glaciers and snow melt water. The North branch, on leaving the foothills, receives the Clearwater and the Brazeau Rivers together with other smaller streams west of Edmonton. The total length of the North Saskatchewan from its source to Edmonton is approximately 301 miles and the drainage area as computed by the Water Resources Branch of the Alberta Government is 10,500 square miles.[3]

The total fall of the river from Edmonton to Lake Winnipeg, as stated in the Voligny Report,[4] is 1,292.6 feet or 1.37 feet per mile. The surveyed mileage between the two points is 941 miles. The river falls approximately 2,491 feet in the 301 miles from the headwaters at the mouth of the Mistaya River to Edmonton for an average of 8.3 feet per mile.

The foothills area yields to parkland approximately 100 miles upstream from Edmonton. From this point to the city, the river flow is added to in a much less spectacular way. Snowfall and rainfall provide the only parkland additions and much of this is lost by evapo-transpiration.[5]

River - Flow Characteristics at Edmonton

In the Appendix, statistical data covering the years 1911 through 1964 is presented to illustrate the discharge characteristics of the river. The maximum, minimum and mean discharge figures for each month of the 54 year period are shown. In this period, the discharge varied a great deal from month to month and even yearly. The all time low for one day

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[3] Pers. comm., Mr. Ron Deeprose, Hydrologist, Water Resources Branch, Government of Alberta, Edmonton, 1964.

[4] L.R. Voligny, op.cit., pp. 51-56.

[5] Pers. comm., Mr. Reg. Bailey, Chief Engineer, Water Resources Branch, Government of Alberta, Edmonton, 1964.

occurred during January, 1940, when a flow of only 220 c.f.s. was registered. This unusually low flow is generally believed to have been the result of an ice jam downstream from Edmonton. The peak daily discharge for the period occurred during the 1915 flood and was recorded at 204,500 c.f.s. or nearly 1,000 times that of the minimum daily flow.

Table XXIV illustrates the peak daily gauge heights and discharges for the 1911-64 period. Gauge heights, recorded from the Low Level Bridge, show wide variations. The low occurred on June 24, 1919, when only 14.25 feet of water was recorded, compared to the high during the flood of 1915 when the measured height was 45.04 feet. The spread is then 30.79 feet. Such a wide spread in gauge heights presents a problem where boating is concerned. Marinas would have to be specially designed with the fluctuation in mind.

River - Flooding

There have been several floods during the recorded history of the North Saskatchewan but the most devastating was that of June, 1915. The following description is based on material from the Voligny Report of 1917 and an unpublished report by Ernest R. MacDonald, an Edmonton resident from 1903 to 1953.

The eastern slopes of the Rocky Mountains, the foothills and the parkland upstream from Edmonton were subjected to an unusually great amount of precipitation in the winter of 1914-1915. In addition, rainfall during the month of June 1915 was very heavy. The combined effects of heavy snow and rain caused a rapid run-off to the tributary streams. The North Saskatchewan reacted accordingly with a flood stage of 45.04 feet on June 28, 1915. This was more than 20 feet above normal. The

TABLE XXIV - NORTH SASKATCHEWAN RIVER AT EDMONTON ANNUAL PEAK GAUGE HEIGHTS AND DISCHARGES

Year and Date		Gauge Height	Discharge cfs	
1911	July 3	21.23	51,400	
1912	July 10	26.00	74,100	
1913	June 30	17.00	29,700	
1914	June 9	24.00	61,700	
1915	June 28	45.04	204,500	High
1916	June 22	23.32	58,800	
1917	June 4	22.06	44,100	
1918	June 16	18.71	35,300	
1919	June 24	14.25	19,900	Low
1920	May 10	22.60	57,200	
1921	May 23	16.13	24,900	
1922	Aug. 18	16.19	25,800	
1923	June 24	27.84	84,100	
1924	July 6	16.83	27,500	
1925	Aug. 18	25.32	75,800	
1926	Sept. 4	22.32	58,700	
1927	June 29	18.29	40,400	
1928	July 7	22.00	61,200	
1929	June 5	19.20	38,100	
1930	July 17	15.82	23,700	
1931	July 2	20.66	39,200	
1932	June 4	24.06	66,000	
1933	June 19	17.87	34,400	
1934	June 1	16.56	28,100	
1935	July 11	20.13	46,300	
1936	Apr. 19	19.07	40,400	
1937	July 17	17.00	31,500	
1938	July 4	18.68	40,000	
1939	June 28	16.92	30,200	
1940	Apr. 18	18.20	35,700	
1941	June 28	16.29	26,700	
1942	July 14	19.91	44,000	
1943	Apr. 12	19.91	44,000	
1944	June 16	33.88	125,900	
1945	June 1	16.14	25,100	
1946	June 24	20.34	44,700	
1947	June 13	17.03	28,600	
1948	May 25	24.14	66,600	
1949	July 22	17.39	32,700	
1950	June 17	21.84	53,700	
1951	May 3	19.50	41,000	
1952	June 25	34.75	132,000	
1953	June 5	20.92	45,800	
1954	June 8	32.79	118,400	
1955	June 15	18.01	32,000	
1956	June 7	16.74	26,600	
1957	May 22	16.24	23,400	
1958	June 30	21.58	52,100	
1959	June 28	21.75	51,700	
1960	July 3	19.07	38,800	
1961	July 31	16.60	27,200	
1962	July 14	16.89	28,500	
1963	July 17	19.28	39,900	
1964	June 21	21.00	48,900	

Gauge Zero = 1999.41 feet.

Source: Water Resources Branch Dept. of Agriculture, Alta.Gov't.

discharge peak of 185,000 c.f.s. daily was nearly four times the long time average of 50,000 c.f.s. for that time of the year.

All of the river valley in Edmonton was affected by this tremendous period of flood. Each of the terraces in the valley had residential development and several, including Walterdale Flats, had commercial development. Walter's saw mill at Walterdale was totally destroyed. Even his barn floated away, finally breaking up against the Low Level Bridge, which, because of this added burden, was also nearly destroyed. The city power plant was out of action for some hours. Housing in Rossdale, Walterdale and Riverdale was inundated with silt-laden water which reached the ceilings of the houses in some cases. A heavy layer of river silt was deposited over the lower terraced areas causing havoc to the vegetation and to the transportation system.

In addition to the combined effect of the snow and rain, several other factors of importance to a flood situation which could disrupt the valley recreation system should be considered.

(i) The geological structure of the mountain catchment area is principally of a limestone series with little or no soil cover and therefore little water storage capacity. Coupled with steep slopes, it is easily seen that rain and a rise of temperature would create a very rapid run-off of mountain snow melt water. This geological structure is even more important today because the increased timber cutting over much of the catchment area of the river only increases the run-off.

(ii) The evapo-transpiration factor is also important to the possibility of a flood stage. When May and June temperatures are cooler than usual, they slow the rate of evaporation and soil absorption, thus contributing more water to the streams. Also, if the ground water level

has reached a saturation point early in May, rains of later May and June can not be accommodated. Therefore, this excess would spill off the land and into the drainage channels feeding the North Saskatchewan. Although expressed in hypothetical terms, all these factors were present during the summer of 1915.

Because several multi-million dollar recreational operations are now located in the valley, the possibilities of flooding are an important consideration. The Royal Glenora Club and the Mayfair Golf complex are two private organizations that are in this potential danger zone. Also, the Storyland Zoo and city owned golf courses are located in problem sites, should a large flood take place. Mr. Reg Bailey, an engineer with the Water Resources Branch of the Provincial Government, believes that the probability, based on recorded data, is that the river is likely to flood on average once every 50 years.[6] It would appear then that the flooding aspect of the river must be seriously considered where the future of recreation in the valley is the concern. In fact, if the discharge exceeds 100,000 c.f.s., several low lying areas of the terraces are in danger of being flooded. In June 1944, flooding occurred with a peak discharge of 121,970 c.f.s. In June 1952, the discharge was 109,700 c.f.s. while in June 1954, it was 100,600 c.f.s. While only minor flooding occurred during the later two periods, it nevertheless shows what can happen when the discharge is only one-half that of the 1915 flood.

River - The Influence of the Brazeau Dam on the North Saskatchewan River And Valley Recreation

The construction of the Brazeau Dam was undertaken in 1962 to fulfill two basic objectives, according to Mr. Jack Reid, Supervisor of Hydro-Electric Development for the Alberta Government.[7] First, the problem

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[6] Pers. comm. R. Bailey, Edmonton, 1964.

[7] Pers. comm. J. Reid, Edmonton, 1964.

of river pollution required a definite control measure. In particular, the town of Fort Saskatchewan, downstream from Edmonton, was facing a difficult pollution problem because of the increasing size of Edmonton and the amount of effluent being discharged into the river relative to the ability of the river to handle it. Secondly, the time was fast approaching when the city would require an additional source of hydro-electric power.

Both the control of pollution and the provision of an added power supply are of concern to recreation. Recreation is limited where serious pollution is evident. Boating and swimming may be restricted where pollution exists. The future use of additional power using facilities for recreation such as night lighting is dependent on the availability of power. Often, recreational power uses are of secondary importance in the overall electrical distribution system. There must therefore be a sufficient supply to conveniently handle the recreational uses.

With the construction of the dam, the pollution factor in the river can be controlled. By raising the minimum daily flow during the winter from less than 1000 c.f.s. to about 2000 c.f.s., the pollution will be largely eliminated. It is in the winter that pollution is most serious because low flows are insufficient to oxygenate the water and kill the bacteria.[8]

Many persons in recreation believed that the river flood situation might also be controlled by the dam. However, Reid says that this is not realistic in view of the fact that the Brazeau River controls only 25 per cent of the waters going into the North Saskatchewan. Any control

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[8] J.L. Reid and K.G. Britain, Design Concepts of the Brazeau Development Including River and Hydrology Studies, Paper No. 16, Annual General Meeting of the E.I.C., Montreal, Canada, 1952.

of the flood possibility will only arise as a result of several favorable factors. Included are the possibility of the dam to accept the Brazeau waters. If the reservoir is full, then further waters can not be impounded and no control measure whatsoever can be exerted by the dam. Therefore a flood of 1915 proportions could be a possibility according to Reid.[9]

The ultimate storage capacity of the dam will be 930,000 acre feet. It is planned to release this water during the extreme low water periods of the winter in particular. However, during the summer, it is unlikely that river flow will fluctuate to nearly the degree that it now does. This has some decided advantages for recreation and some disadvantages as well. While the low water periods that now impede the use of boats might be reduced in frequency, the high water will be considerably reduced also. To date, it is in this high water period that the boating is best because at this time, bars and other shallows can be navigated with success. A leveling out of the flow would appear to provide more of a recreational boating problem than might at first be suspected. Reference to the Appendix illustrates that the months of June, July and August usually have a flow in excess of 10,000 c.f.s. This is believed by the author to be the minimum discharge at which safe boating can be conducted.

The Brazeau Dam will have a very significant influence on the use of the river during the winter according to Bailey.[10] While present winter ice is stable in reference to its binding to the banks, the continual rise and fall of the river level will tend to make the ice of the future much less stable. Although Reid estimates the rise caused by a surge to

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[9] Pers. comm. J. Reid, Edmonton, 1964.

[10] Pers. comm. R. Bailey, Edmonton, 1964.

be only 0.6 to 0.8 of a foot,[11] this according to Bailey is sufficient to cause ice cracks with a flooding over the surface.[12] In addition, the cracking and lack of bank stability may create problems during the spring break-up that have not previously been experienced.

Skaters and touring skiers using the river ice surface will be most affected. Winter sports shows, such as Muk-Luk Days, will require additional protection services because of the great numbers of persons that venture onto the ice to watch the dog races and other events. The unstable ice may not stand the increased weight. Also, because of increased friction caused by the increased winter flow, the ice will not be as thick as previously. It will therefore be unable to support as great a load as before, according to Bailey.[13]

River - A Navigational Channel

Not since Voligny's work, started in 1912 and completed in 1917, has there been a determined effort to plot the navigational channel of the North Saskatchewan River. As much of the future of river recreation is dependent on a known channel, this has been a serious problem for boating enthusiasts in particular. At low water the shallows and other obstacles have prevented safe boat operation, whereas, if the channel were known and marked, the river could be used safely for much of the low water periods of August and September in particular.

Although the Voligny Report is an extensive treatment of the river, it is nearly 50 years old, and changes in the channel might be expected during the intervening years. Also, the channel study of the

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[11] Pers. comm. J. Reid, Edmonton, 1964.

[12] Pers. comm. R. Bailey, Edmonton, 1964.

[13] Pers. comm. R. Bailey, Edmonton, 1964.

Voligny Report begins at the High Level Bridge. The natural upstream point of interest to Edmontonians is Big Island. Therefore, the study is limited in terms of its usefulness to river valley recreation.

With the recognition that a study of the channel was of utmost necessity, a survey was begun in July of 1964 and completed during the low water period of November the same year. Using a weighted line marked off in feet together with a six foot paddle, marked in feet and inches, a traverse of the river was conducted from Big Island to the eastern city limits. By measurement, much of the deep water channel was located. In some areas, however, little in the way of a channel was apparent and therefore the study had limited usefulness. However, theoretical evidence as a result of research into the physical character of rivers in general led to some revealing characteristics of use in the location of the deep water in the North Saskatchewan.

River - A Theory of Deep Water Location

It is well known that the off-side of a meander curve contains water of greater depth than the inside of that curve. But this is of little value in the finding of a navigational channel for a stretch of the North Saskatchewan over 25 miles in length. In this stretch there are not only meanders but relatively straight stretches as well.

Initial investigation proved unsatisfactory in solving the problem of water depths as they related to the river. However, the work of Friedkin on the Mississippi proved to be the starting point in the formulation of a useful theory.[14] In this study, the basic problems were to determine the elementary principles involved with a meandering

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[14] J.F. Friedkin, A Laboratory Study of the Meandering of Alluvial Rivers, U.S. Army, Vicksburg, 1950.

river and to determine the changes brought about by bank stabilization. The solution to this second problem is illustrated in part by figures 15 and 16. In stabilizing the bank by the construction of a concrete revetment, the channel within and beyond the meander was deepened. Examples of the bottom contour and profile are illustrated by the latter figures. They show that the water within the meander deepened as did that of the cross-over channel.

From the studies of N.E. Kondrat'ev et al,[15] some of the flow characteristics of rivers in "bendways" or meanders were discovered. From figure 17, the flow of water in sharp and flat bends is illustrated. It will be noted that in a sharp bend, the greater force is applied to the downstream part of the bend. These forces produce a greater erosive action on the river bed and thus provide deeper water. Coming out of the meander, the water force is equalized. It is in the cross-over channel that shallow water occurs. Bars may form on the inside of the downstream part of the meander. The carrying capacity of the water thrown from the offside of the curve is reduced as it travels to the opposite side. Therefore, there is a settling of alluvial materials with this reduction in carrying capacity.

As Friedkin points out "...rivers are deeper in bendways because of greater turbulence and erosive power of the flow in bends as a result of impingement against concave banks."[16] It would appear from figure 15 that the construction of the revetment increased the impingement because the channel thereafter increased in depth.

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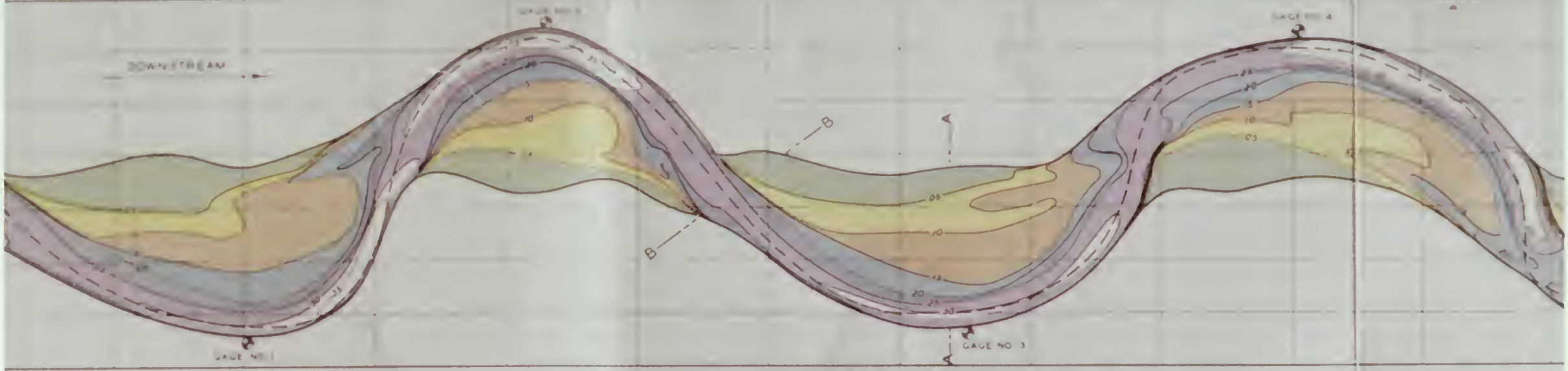
[15] N.E. Kondrat'ev et al, River Flow and River Channel Formation, Leningrad, 1959. Trans. from the Russian by Y. Prushansky, S. Monson, Jerusalem, 1962.

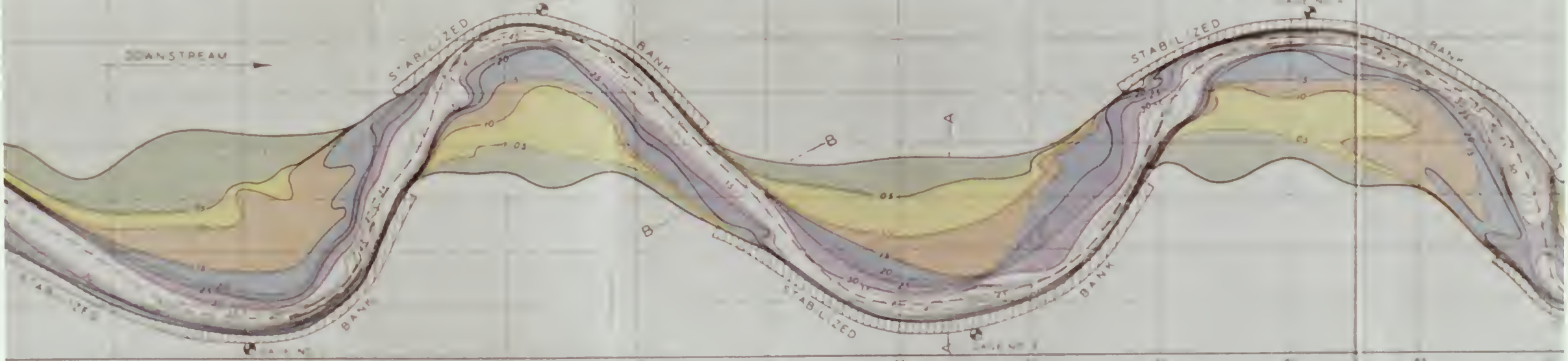
[16] Friedkin, op.cit., p.4.

BANK STABILIZATION TEST 2

HYDROGRAPHIC MAPS OF CHANNEL



BEFORE BANK STABILIZATION



DISTANCE IN FEET

AFTER BANK STABILIZATION

Figure 15

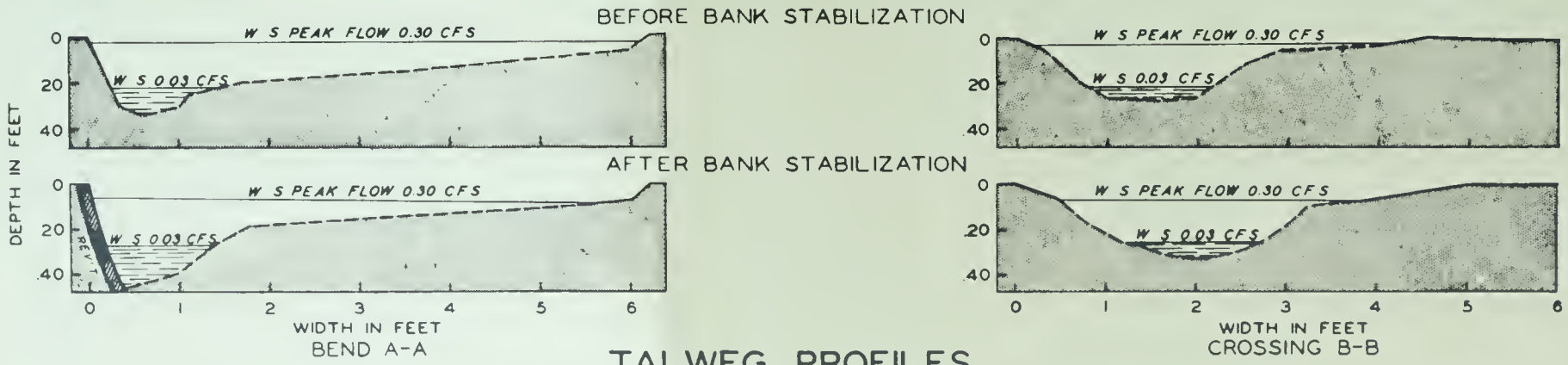
Source: Friedkin, J.F.
A Lab Study of the Meandering of Alluvial Rivers

LEGEND

NUMBERS REPRESENT DEPTH BELOW WATER SURFACE

BANK STABILIZATION TEST 2

TYPICAL CROSS SECTIONS



TALWEG PROFILES

TEST DATA

BED MATERIAL	CRUSHED COAL 75% LOESS . 25%
DISCHARGES	.0 03 TO 0.30 C F S
VALLEY SLOPE	. . 0.003

Figure 16

MISSISSIPPI RIVER COMMISSION
U. S. WATERWAYS EXPERIMENT STATION

LABORATORY STUDY OF THE
MEANDERING OF ALLUVIAL RIVERS

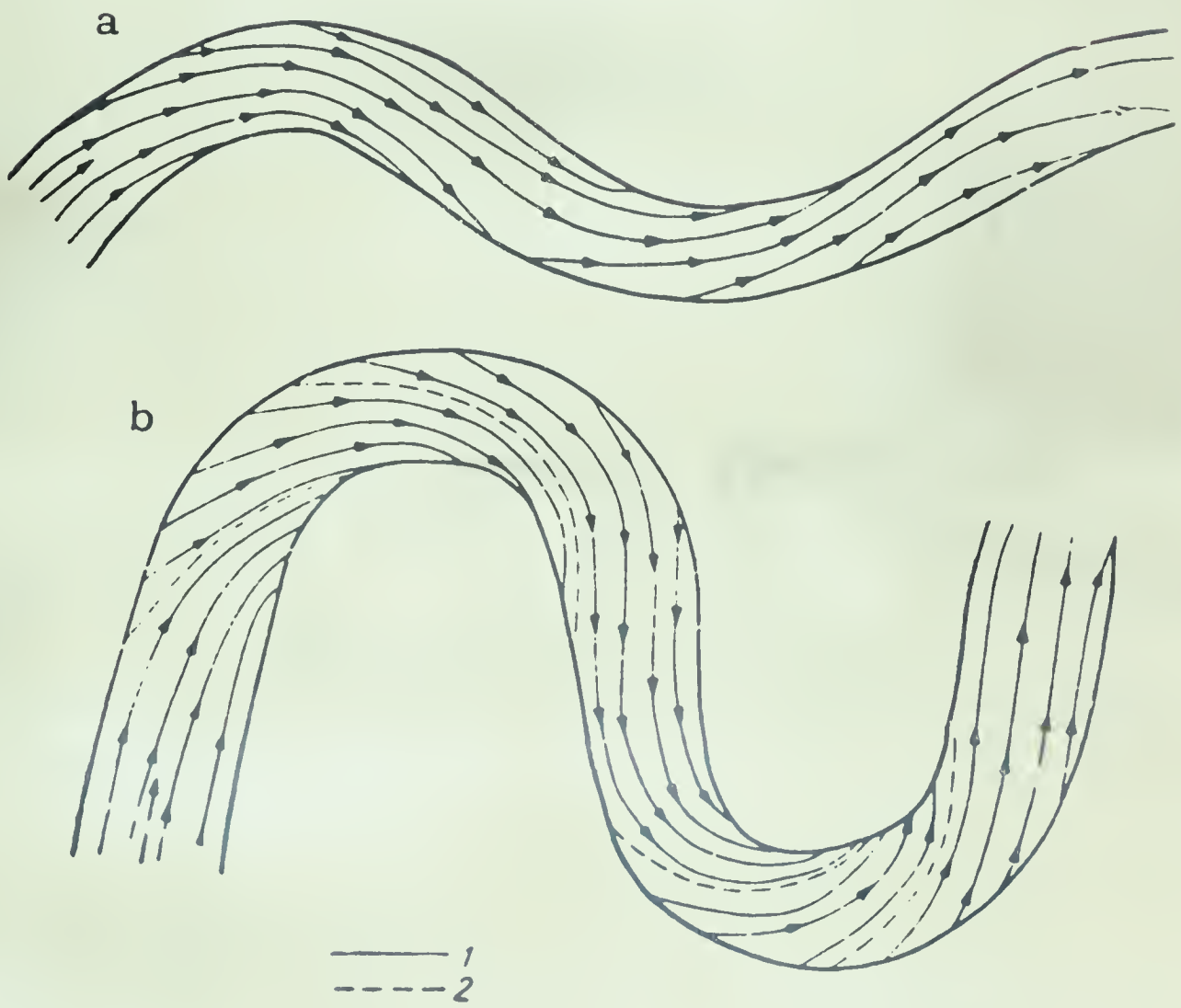


Figure 17 Scheme of bottom flow lines for a flat (a) and a sharp (b) bend (according to Rozovskii)

1-bottom flow lines; 2-boundary between flow lines crossing and not crossing the channel.

Source: Kondrat'ev, N.E., River Flow And River Channel Formation

The Kondrat'ev research team used the term "transverse circulation" to describe the water action in bendways. Further, they postulated that in the sharp bendways, the transverse displacement of sediment represents a substantial part of the whole sediment transportation system. Then it follows that the sharp bendway will have deeper water. In flat bendways, the transverse displacement is less pronounced and the bottom sediments will be removed to a lesser degree providing a channel less deep than that in the sharp bendway.[17]

During field investigations of the North Saskatchewan River, it was noted that where there were high banks fronting the bendways, the water was deeper and the channel was more easily defined. Whereas, when the bendway was carved from softer terrace materials, the water was shallower and the channel less easy to locate. Also, the channel tended to be more central in the bendway rather than on the extreme outside of the curve. Field work indicated that where the bendway was fronted by a high bank, in excess of 75 feet, deep water was assured. Where the bank was of less than 25 feet, the water was relatively shallow. In November, the deep water averaged 10 feet in the high bank bendways and the shallow water averaged six feet.

In consideration of the work of Friedkin and others including Leopold,[18] it is now the belief of the author that the materials through which the meander must carve, in large part determine the depth of the water and the position of the channel within the bendway. The relative

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[17] Kondrat'ev, et al, op. cit. pp. 67-68.

[18] Luna B. Leopold, G.M. Wolman, J.P. Miller, Fluvial Processes in Geomorphology, W.H. Freeman,, London, 1964.

sharpness of the bend must also be considered of course. The above research materials in particular support this hypothesis.

In figure 15, as an expression of Friedkin's work, it is quite obvious that the impingement effect on the water by the revetment created a deeper channel. From the work of Kondrat'ev and Rozovskii, the flow characteristics of the water can be traced. By combining the research of these studies, it is quite probable that it is the material within the bendway which in part determines the water depth. It would appear that it is the mass and density of the bank materials which is of most importance in the cutting of river channel beds within a meander. As the hardness of the mass increases, the erosive action of the water will be directed more to the channel. This will be more evident when the bed materials are somewhat less dense than those of the bank and thus more easily eroded as in the North Saskatchewan.

In support of this hypothesis, not only the North Saskatchewan within Edmonton would appear to fit the circumstances described. In addition, the McLeod River in the area of Camp 33 south of Hinton, exhibits this similar phenomenon. The bendways that are carved from rock are much deeper than those curving through floodplains even though the curve dimensions are similar. Creeks of the above region also exhibit this characteristic and deep pools are most evident where the offside of the meander faces a rock mass.

Although much of the channel as illustrated on figure 18 was determined by field work, the theoretical research would appear to support the channel location. In addition, the hypothesis presented was most useful in the actual plotting of this channel on the map. Field work alone did not determine the channel characteristics but with the

LEGEND

RIVER VALLEY BOUNDARY

CONTOUR LINES

RIVER CHANNEL

DEEP WATER

SHALLOW WATER

SAND AND GRAVEL BARS

SCALE 1:50,000

1.25 inches to 1 mile approximately

1 0 1 Mile

NOTE RIVER VALLEY CONTOUR INTERVAL 25 FEET

SOURCE: MINES AND TECHNICAL SURVEYS, OTTAWA 1962, AND FIELD WORK

NORTH SASKATCHEWAN RIVER VALLEY
EDMONTON

RELIEF AND THE CHANNEL

DATE: NOV. 1964

FIGURE 18

addition of theoretical research, it was possible to approximate the deep and shallow areas of the river, according to their recreational importance.

River - The Necessity for a Marked Channel

The mapping of a channel is of limited use to recreation unless it is accompanied by some system of marking. A buoy network could be easily established which would provide adequate visual aid in the location of the deeper water and other hazards on the river. Such a system could make the river much more pleasurable for the less experienced boat operator. Excursion or other similar boats of a large size could operate more efficiently at night which according to Mr. Tom Harris of the Big Island Development Company "is one of the most profitable periods of operation, when safety can be assured."[19]

A marker system as suggested is very necessary because of the debris littering the river in some locations. Car bodies dumped from the upper plain are a hazard along several reaches of the river including the area opposite and just upstream from Whitemud Creek. Shallow water is evident from the Groat Bridge to the High Level where less than three feet was found during the late October field work. Marker buoys or similar markings are required beneath all the bridges from the Groat to the Beverly. The channel is not easily determined under these bridges and would appear more subject to change than at any other points along the river. Spring ice jams and other phenomena create very changeable currents in these locations which alter the deep water positions.

To use the river effectively, the boat operator can follow three considerations and be sure of finding the best available water over the majority of the river during most of the time. 1) Stay on the outside of all meanders where the water is deepest. 2) Be aware that the cross-

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[19] Pers. comm. Mr. Harris, Sec. Treasurer, Big Island Development Co., Edmonton, 1964.

over channels are always shallower than the meanders. 3) Bars usually form on the inside and just downstream of the meander. It is on these locations that"dead head" logs and other debris will prove to be the greatest hazard. The current is insufficient to remove these hazards in most years.

CHAPTER V

CONCLUSIONS

The North Saskatchewan River Valley has been an important recreational resource for over 100 years. The establishment of the early trading posts within Edmonton provided the economic base from which the settlement grew. As the settlement increased in size, the recreation of the inhabitants became more firmly established in the river valley.

Within the valley, the physical qualities have long assured a quantity and a variety of recreational attractions seldom exceeded in other settlement areas. The relief characteristics are such that active and passive forms of recreation can be conducted on an organized or a casual basis in over 4,000 acres of parkland. The soils of the valley provide an abundant source of food for vegetation, where there is a low density form of recreation. Where high density activities are conducted, soil enrichment programs and artificial watering systems are necessary to assure an adequate growth of grasses in particular. The weather and climate of the valley are generally more acceptable for recreation than those of the plain above. In summer heat, air drainage from the plain and a general movement of air down the valley provide a cool atmosphere in which recreation is most enjoyable. Winter activities conducted in the valley are much more satisfactory than those on the plain in many instances; for the skier the snow lasts longer than on the plain; for skaters, the ice is as good as that on the plain and it too lasts longer due to the somewhat cooler air and lesser degree of insolation.

Of all the geographic phenomena of the river valley, perhaps the most significant is the river itself. In many respects it is the controlling influence for most land forms of recreation. The water from the river is used to water the golf courses and aid the vegetative growth of playing

fields. The river influences the climate in that it produces microclimates both in the summer and in the winter. These microclimates are conducive to recreation in most aspects. The higher humidity is important to a good vegetative cover in that this humidity allows more of the rain or artificially sprinkled water to be used by the soil. Evaporation effects are less noticeable in the valley.

As the majority of the recreation within the valley is conducted on the low lying terraces, flooding of the river could destroy much of the present pattern of facilities such as the ball diamonds, golf courses and even the Storyland Zoo.

The river water surface contains the largest usable unit surface of any valley recreational area. Over 2,000 acres require little or no maintenance and are there for all to enjoy as a passive spectacle. In addition, the majority of the water surface is well suited for the use of small pleasure boats during the warm summer months. It is relatively slow moving and has no serious cross-currents or other critical characteristics that might hamper safe recreation. Only in the use of power boats is there a problem because of the shallows that prevail over much of the river within Edmonton. These shallows require care if they are to be navigated safely.

The recreational use of the river has been greatly hampered to date by a lack of navigational aids in map or other form. Even persons with years of experience on the river have failed to make use of its potential. Perhaps as a result of the investigations carried out in the preparation of this thesis, further interest may have been created to the benefit of boating enthusiasts, a summer recreational group that is growing at a very rapid pace.

As a result of the casual recreation survey conducted in 1963, it is apparent that participation is primarily dependent on the facilities offered. Many of the present recreational land uses are showing signs of overcrowding, the golf courses in particular. New facilities are being developed in an attempt to satisfy the recreational needs of the population. In future, it may well be necessary to remove at least one of the public golf courses from the river valley and replace it with a higher density facility such as "free play" fields or sites for organized games. As the valley is central to the entire city, this centrality should be exploited where possible. Although started over 50 years ago, there is really no organized system of paths or hiking trails within the valley. The trail from Queen Elizabeth Park to Whitemud Creek has been badly neglected for a number of years. Little in the way of new trail development has taken place in the valley.

This thesis has attempted to provide an integrated study of the geographic phenomena which are characteristic of the river valley and important to recreation in Edmonton. As Edmonton continues to grow, so will the recreation movement. As recreation is an outgrowth of a successful society, any recreational development of the river valley must show the signs of a planned and not an unplanned growth. Perhaps as a result of the methodology used in this thesis, other geographers might be inclined to improve on it to the advantage of the leisure aspects in society and to the advantage of the growing field of recreational geography.

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YEAR	DISCHARGE in c.f.s.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	MAX												
	MIN												
	MEAN												
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APPENDIX

TABLE OF MONTHLY DISCHARGES

Source: Water Resources Branch, Department of Agriculture, Province of Alberta

YEAR	DISCHARGE in c.f.s.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

6

TABLE OF MONTHLY DISCHARGES

YEAR	DISCHARGE in c.f.s.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1690
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	450
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	934
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	All time low [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE OF MONTHLY DISCHARGES

YEAR	DISCHARGE in c.f.s.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	MAX												
	MIN												
	MEAN												
	MAX												
	MIN												
	MEAN												
	MAX												
	MIN												
	MEAN												
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	MEAN												
	MAX												
	MIN												
	MEAN												

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TABLE OF MONTHLY DISCHARGES

YEAR	DISCHARGE in c.f.s.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	MAX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20790	9650	4520	3170	1660
	MIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5460	4560	3180	700	742
	MEAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12280	5624	3636	1797	1252

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TABLE OF MONTHLY DISCHARGES

NORTH SASKATCHEWAN RIVER AT EDMONTON
DRAINAGE AREA 10,500 SQ. MILES

YEAR	DISCHARGE in c.f.s.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1961	MAX	1510	1310	3330	3110	22,190	24060	27,210	27,160	10,100	5460	2660	2330
	MIN	1060	984	1070	2010	1920	11,670	7490	9730	4010	2480	575	1150
	MEAN	1286	1174	1719	2515	9129	17,230	13,760	15,040	6237	3350	1550	1830
1962	MAX	2470	2680	2980	7890	21,700	24,800	26,000	27,000	9530	4710	5100	3090
	MIN	1720	1750	1260	1430	3170	5820	11,500	7370	4500	2560	2300	1400
	MEAN	2060	2240	1670	5330	7910	13,800	17,000	12,500	6520	3370	4170	2380
1963	MAX	3050	2680	4890	16,000	19,700	21,900	37,100	16,300	10,100	6210	3590	3450
	MIN	1330	1540	2280	2770	6300	11,500	11,000	7180	5170	2280	1350	1880
	MEAN	1920	23 20	3010	8380	9680	16,500	19,500	11,400	7370	3740	2150	2350
1964	MAX	2870	2730	2870	5080	46,500	47,600	30,200	12,000	15,300			
	MIN	2090	2090	2050	2520	3970	6200	8980	5270	4800			
	MEAN	2370	2310	2390	3730	13,100	25,600	17,900	7970	8120			
	MAX												
	MIN												
	MEAN												
	MAX												
	MIN												
	MEAN												
	MAX												
	MIN												
	MEAN												
	MAX												
	MIN												
	MEAN												
	MAX												
	MIN												
	MEAN												

It is suggested that "safe" small boat navigation is only possible when the discharge is at least 10,000 c.f.s. At this discharge, major river navigational obstructions can be avoided, i.e. sand bars, litter and large boulders. When the discharge drops below 6,000 c.f.s., river travel beyond the western city limits is very difficult. At extreme high water of over 45,000 c.f.s., logs and other debris litter the river and prove hazardous to navigation. Beyond 100,000 c.f.s., flooding may become a problem to several low lying terrace areas such as Rossdale.

TABLE OF MONTHLY DISCHARGES